Railway Engineering and Maintenance

PROTECT THE VULNERABLE POINT

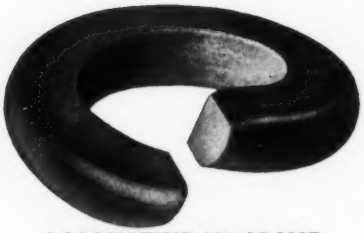
Though trimmed down to 1/10 the width of a rail, the switch point is subjected to many tons impact and severe grinding action from every passing wheel.

MACK SWITCH POINT PROTECTORS

make the point last as long as the heel, thus pro-longing the life of the switch rail [illegible] times.

Reliance HY-CROME Spring Washers

HY-PRESSURE HY-CROME
"The Edgemark of Quality"

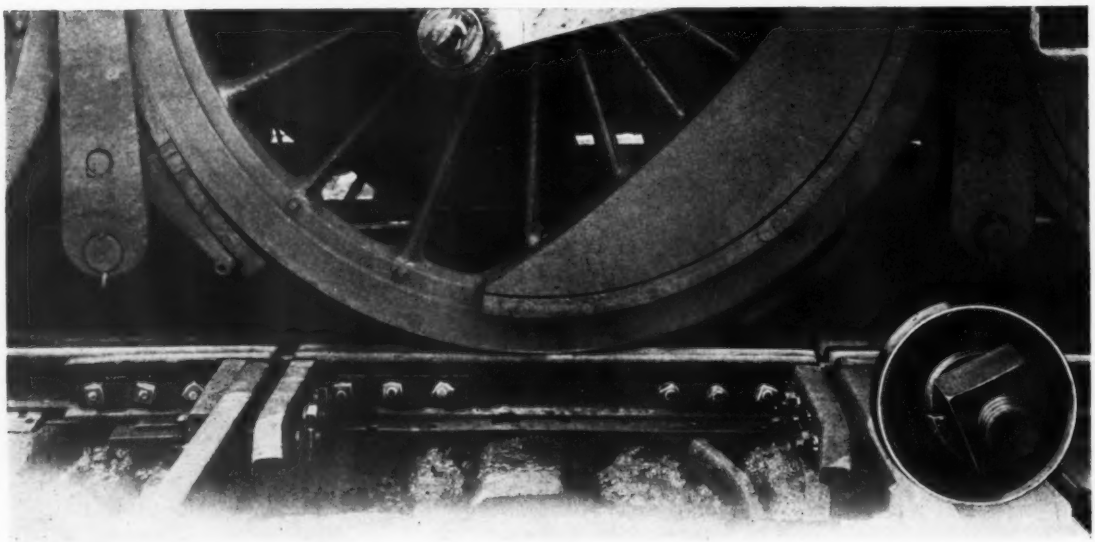


LOCOMOTIVE HY-CROME
"Prevents Bolt Looseness"

"A Chain Is As Strong As Its Weakest Link"

RELIANCE HY-PRESSURE and LOCOMOTIVE HY-CROME Spring Washers insure a pre-determined bolt tension which will efficiently maintain and protect railroad track joint and motive power assemblies. RELIANCE HY-CROME Spring Washers are a strong link in the chain of railway track and motive power performance.

RELIANCE HY-PRESSURE HY-CROME for joint bolts and RELIANCE LOCOMOTIVE HY-CROME Spring Washers for use on engine bolts are scientifically manufactured to assume their full responsibility in compensating for looseness and wear in bolted parts. Serious consideration of these facts will pay your railroad dividends.



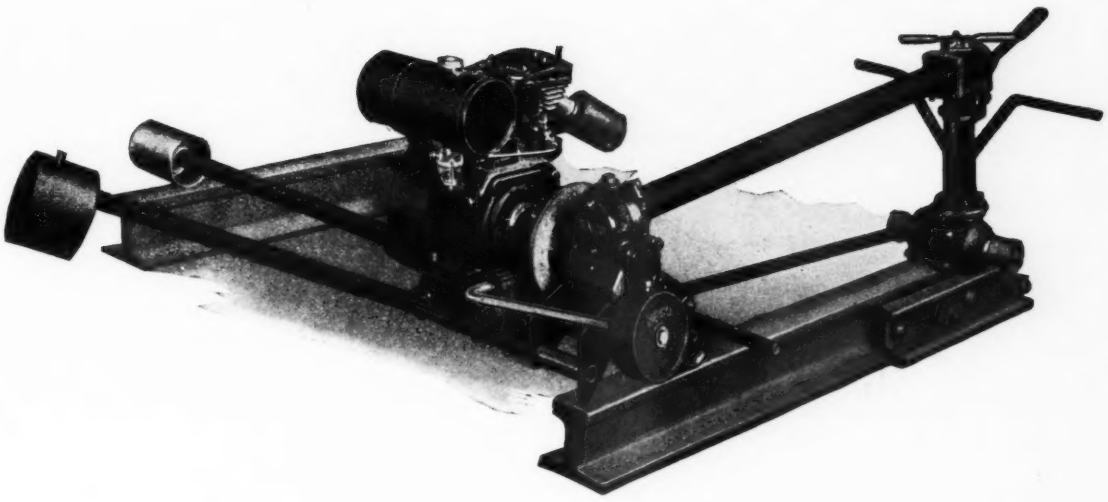
EATON MANUFACTURING COMPANY

RELIANCE SPRING WASHER DIVISION

MASSILLON, OHIO, U.S.A.

Branches: New York - Cleveland - Detroit - Chicago - St. Louis - Montreal

Raco Power Track Machine



A marvel of efficiency at low cost.

One man operation.

Weighs only 350 pounds (a two man carry).

Low weight, counterbalanced operating head and convenient and easy controls make for maximum speed with minimum fatigue of operator.

Designed and built for hard, continuous service.

Uniform tension on all bolts—

Allows equal expansion and contraction at all joints.

Minimizes rail batter.

Lessens chipping.

Prevents angle bar deformation and excessive wear.

Uses fewer bolts.

Lasts several times as long as hand tightening.

RAILROAD ACCESSORIES CORPORATION

MAIN OFFICE
405 LEXINGTON AVENUE
(Chrysler Building)
NEW YORK

Published monthly by Simmons-Boardman Publishing Corporation, 105 W. Adams St., Chicago, Ill. Subscription price, United States and Possessions, and Canada, $2.00; Foreign $3.00. Single copies 35 cents. Entered as second-class matter January 29, 1933, at the postoffice at Chicago, Illinois, under the act of March 3, 1879, with additional entry at Mt. Morris, Ill., postoffice. Address communications to 105 W. Adams St., Chicago, Ill.

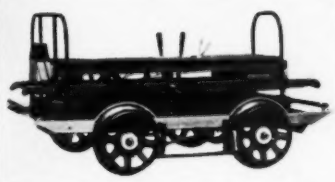
POWER
FOR PEAK-SEASON PULLING

Lightness
FOR OFF-SEASON 1-MAN HANDLING

Fairmont M14 Series G

This powerful car, seating 6 men, can haul loaded trailers on level track. Extension lift handles reduce the lift at the rear to only 105 lbs. The power plant is Fairmont's efficient RO 5 to 8 H.P. roller-bearing engine which combines great strength with light weight for economical maintenance. Ask for bulletin 397.

THESE Fairmont LIGHT SECTION CARS GIVE YOU BOTH!

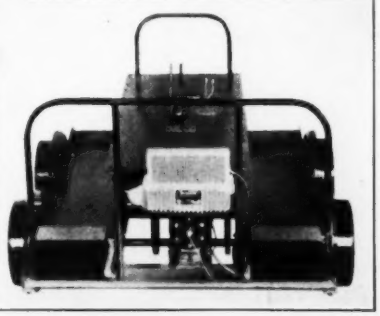


Fairmont M14 Series D

There is plenty of room on this aluminum framed car for the longest tools which might be carried. Its Fairmont 5 to 8 H.P. ball bearing engine and endless cord belt transmission assure plenty of power for the heaviest hauling jobs. Lift weight—95 lbs. For full details see bulletin 302C.

Fairmont M14 Series E

This unit (at right) has the same pulling capacity as the M14 Series D. While not as light, this steel framed car can be handled safely by one man. The rear lift is only 105 lbs. See bulletin 330B.

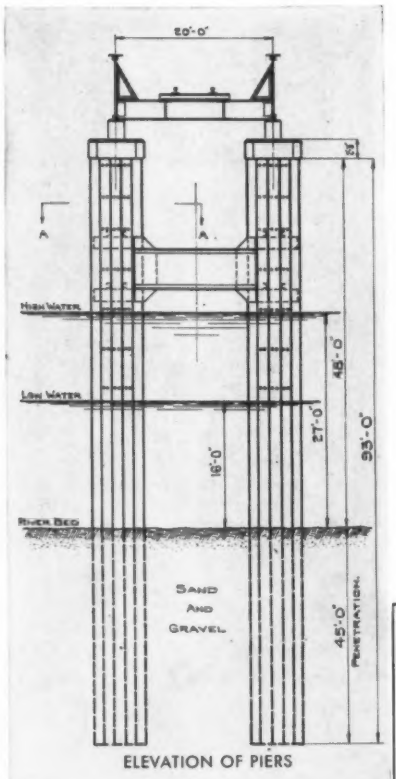


● Here is equipment that can be kept busy all year—in summer, hauling men and supplies economically over the section—in winter, carrying roadmasters and workers quickly on inspection and repair trips. Each Fairmont M14 car is light enough in weight to be handled with complete safety by one or two men. Ruggedly built, amply powered and sensibly designed with major parts readily accessible, Fairmont M14 one-to-six men cars serve at the lowest operating and maintenance costs. Ask about these modern cars today. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

erformance
N THE JOB
COUNTS

OF ALL THE CARS IN SERVICE TODAY
MORE THAN HALF ARE FAIRMONTS

MZ-38 Piling Builds Railroad Bridge Pier *at a 60% Saving!*



ELEVATION OF PIERS

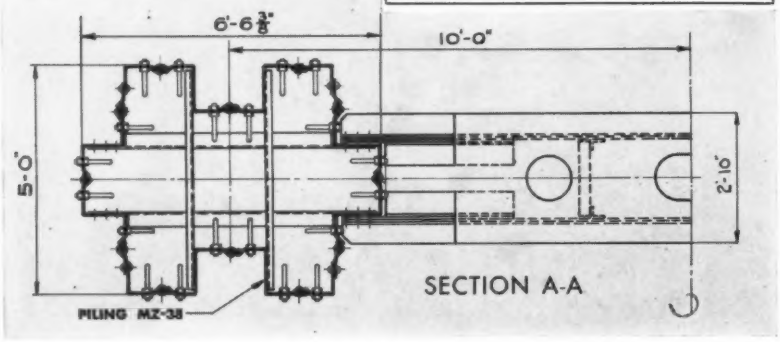
IN these two twin piers, U·S·S Steel Sheet Piling MZ-38 proves its versatility by doing an exceptionally fine bearing pile job at a 60% saving over the cost of one center mass pier for two truss spans.

Each twin pier supports a total superimposed load of approximately 2,000,000 pounds. This is carried primarily by the sheet piling, supported by skin friction in the sand and gravel which is adequate to support entire load. Each MZ-38 Pile, including the corners, supports an average of 42 tons. (Although piers were concrete filled after sheet piles were driven, no bearing value of the concrete on the enclosed sand is necessary for support of the loads.)

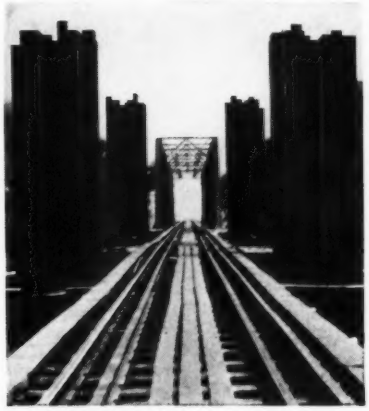
Sheet Piling pier construction like this has the double advantages of maximum speed and minimum cost. It requires no cofferdam, no form work, no excavation. Involves no delay in construction, offers minimum obstruction to stream flow. And in addition it provides a practical construction to take care of very deep scour conditions at least expense.

U·S·S Steel Sheet Piling is available in the most complete range of dimensions and sections — straight-web, arch-web and the new "Z" sections illustrated here. Call on us for helpful cooperation of our piling specialists — they may be able to save you money too.

River bed at the bridge site is glacial drift about 150 ft. to rock and consists of sand, gravel, clay and large gravel. River scour is about 15 feet at site. The MZ-38 Piling in 93 foot lengths was driven to a depth of 45 feet by a McKiernan-Terry Hammer to a resistance of 20 to 25 blows per in. for the last 5 feet, and for the last foot, 30 blows per in.



SECTION A-A


NO INTERRUPTIONS! By placing each pier outside the clearance line, both twin piers were built without any interruptions of traffic. This type of construction is independent of water hazards because it is built in small units which are readily handled in swift water or where stream is subjected to rapid and considerable fluctuations of stage as was the case here.

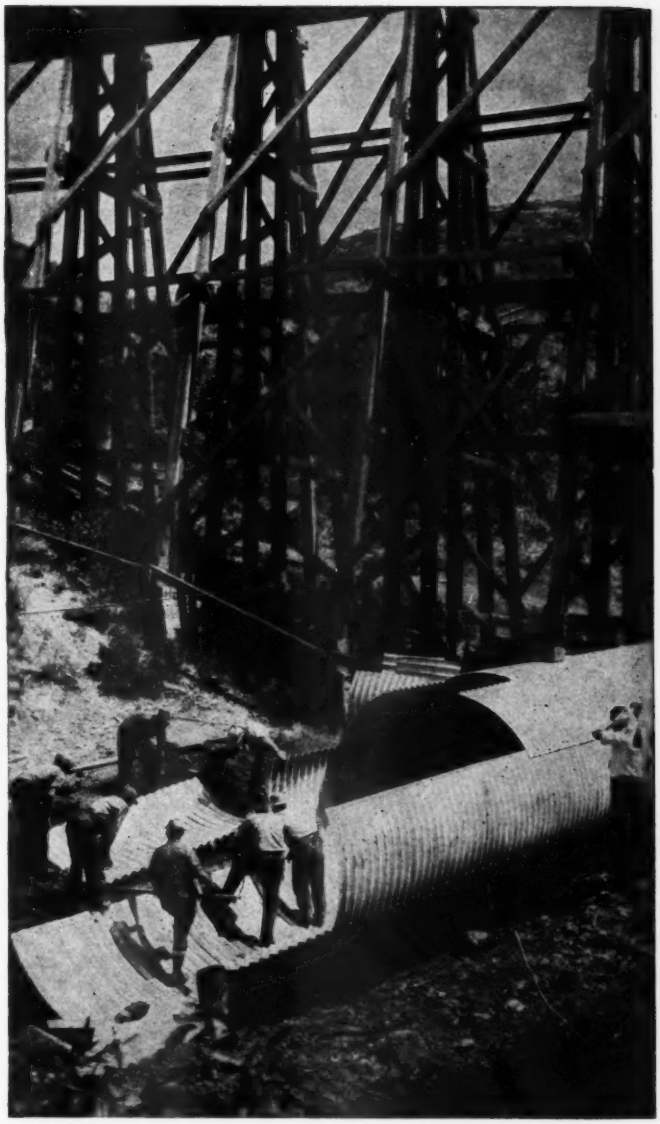
U·S·S STEEL SHEET PILING

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

REPLACE OLD TRESTLES this quick, economical way



Replacing a 50-foot trestle on a main line railway with 200 feet of 10-foot diameter Armco Multi Plate Pipe.

START NOW to eliminate fire hazards and excessive maintenance costs, by replacing those old trestles with Armco Multi Plate.

Only a few days are required to erect the plates and bolt them together on the job. There's no delay to traffic. No power equipment is needed. And the finished structure can immediately be backfilled.

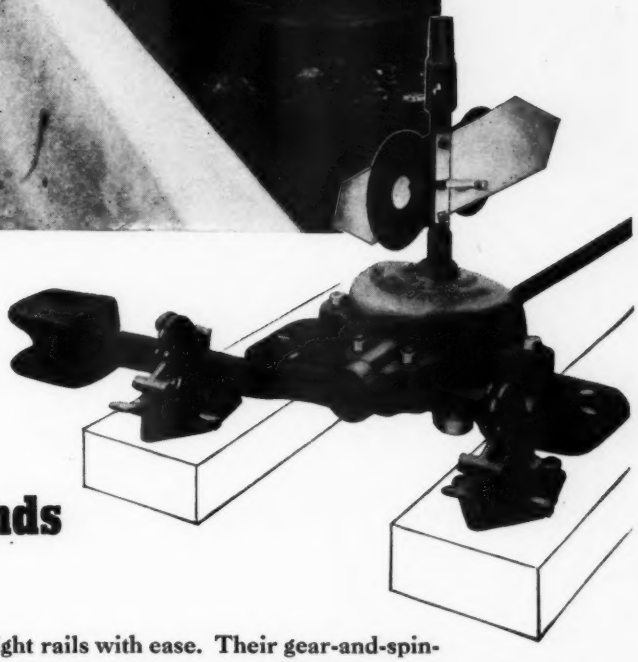
Thousands of Armco Multi Plate structures are serving efficiently under fills ranging up to a depth of more than 80 feet. And since the heavy gage plates are made of rust-resisting ARMCO Ingot Iron, Multi Plate should last a lifetime.

Call or write our nearest office for specific, helpful information. Ingot Iron Railway Products Co. (member of the Armco Culvert Mfrs. Assn.), Curtis Street, Middletown, Ohio; Atlanta, Salt Lake City, Los Angeles, Minneapolis, Spokane, St. Louis, Richmond, Portland, Philadelphia, Dallas, Houston, Denver, Chicago, Cleveland, Berkeley, Calif.

MULTI ARMCO PLATE

ARMCO MULTI PLATE

A PRODUCT ORIGINATED AND DEVELOPED BY ARMCO ENGINEERS



For these big new rails

New Century Switch Stands

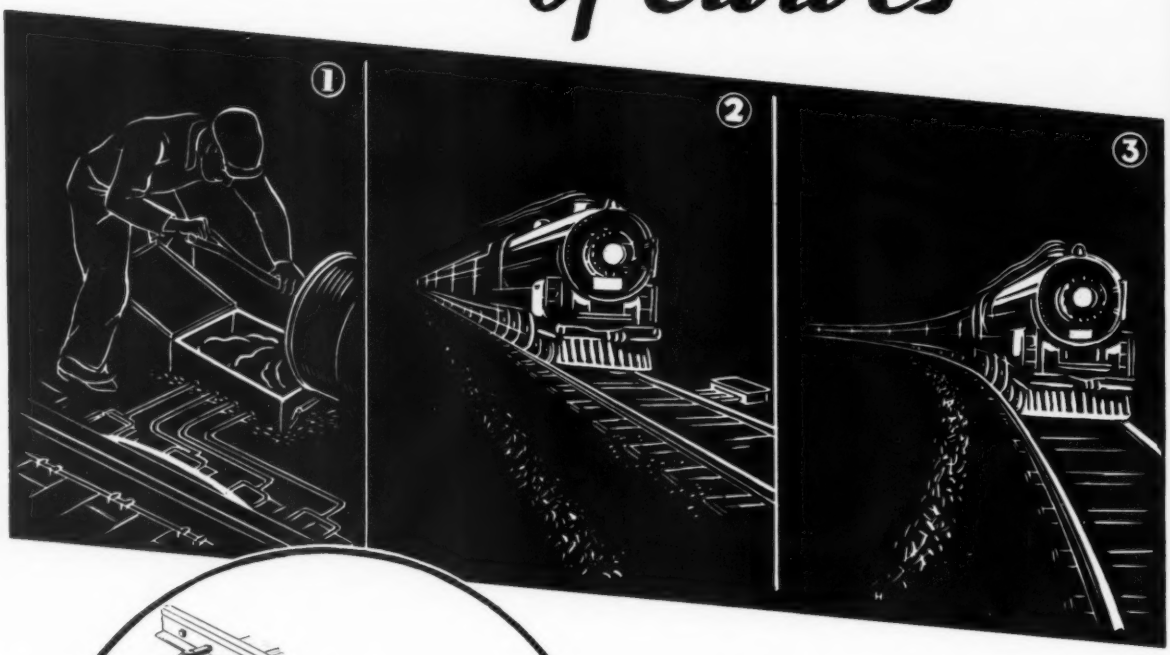
New Century Stands can handle any weight rails with ease. Their gear-and-spindle action, with a 30 deg. free-swing leverage, makes them easy to throw. Gears of tough, malleable iron; housing of heavy gray iron; drop-forged spindle, pinion shaft, and crank—such rugged features make these stands practically indestructible.

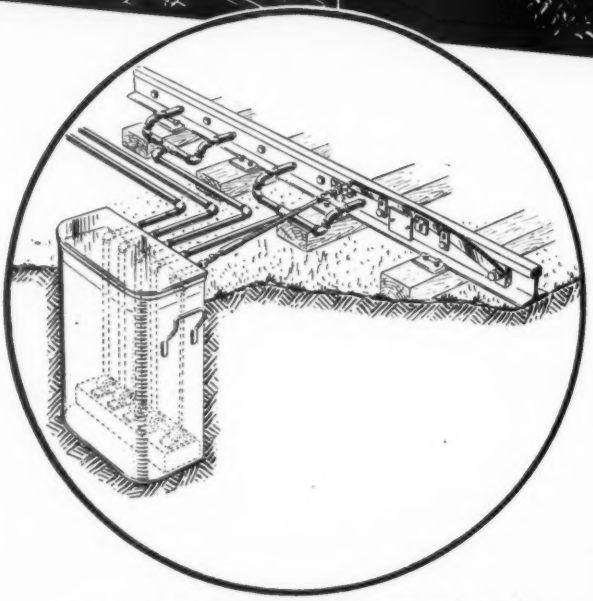
New Century Stands have been tested by 40 years of service in all sections of the country. Many main-line systems use them exclusively. For a tried-and-proved product, one that will give years of smooth, trouble-free service even with today's heavy switches, specify Bethlehem New Century Stands.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

Long Range Lubrication of Curves

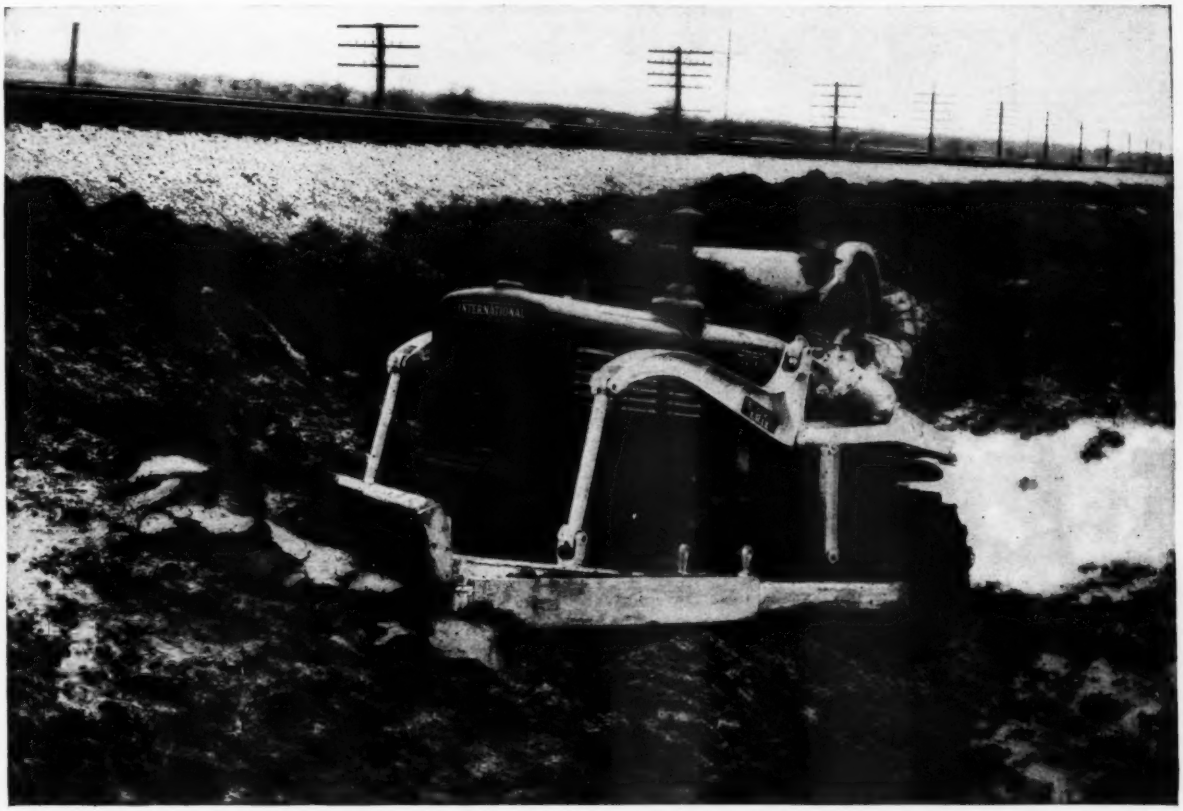




We shall be glad to send you drawings and complete engineering data concerning Racor Rail Lubricator

WITH THE RACOR RAIL LUBRICATOR curve lubrication is simple and inexpensive. Waste of lubricant is reduced and rail and wheel life prolonged.

Two of the three steps necessary in lubricating curves with the Rail Lubricator are automatic. All the operator does is ❶ fill the reservoir and oil the exposed parts. Passing wheels ❷ pick up the grease from the delivery rail and ❸ deposit it on the rails at curves. Lubricators may be installed at convenient locations, since tests prove that curves may be lubricated from distribution points located several miles away.



An International T-40 TracTracTor cleaning out a culvert and ditch and bulldozing the dirt up on the shoulder. This model is also available with a Diesel engine, as is the Model TD-35 TracTracTor.

You Get Year-Round Performance When INTERNATIONALS Take Over

An International TracTracTor, similar to the above outfit, removing snow in the yards during the freak blizzard in April.

Month-in and month-out the year-round, International TracTracTors give you the power you need for "off-track" work. Shown here are two typical jobs you can expect Internationals to do efficiently, fast, and at low cost. Whether it is cleaning ditches, banks, culverts, and under trestles or bridges; pulling ties; moving tracks; replacing rails; building grades and reshouldering slopes; digging holes and setting posts; plowing fire breaks; removing snow; or other "off-track" work, International will do it better. Ask the nearby International dealer or Company-owned branch for complete information on International TracTracTors, Wheel Tractors, and Power Units.

INTERNATIONAL HARVESTER COMPANY

(Incorporated)

180 North Michigan Avenue **Chicago, Illinois**

INTERNATIONAL Industrial Power

The Salesman Who Received An Order On His First Call

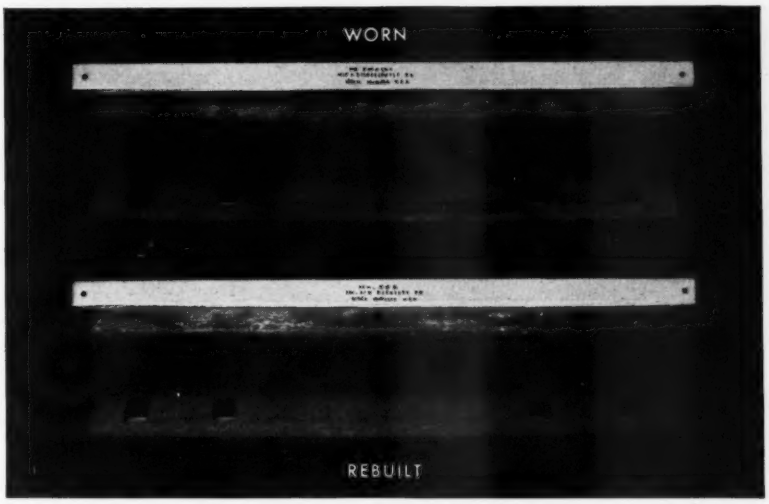
on a railway died of the shock, for railway orders are not secured that way.

Rather, the railways are large organizations; many officers must be "sold" before a device or material is adopted; these men investigate and study a product before acting; they are widely scattered over the lines.

The ideal way to get one's story over with these men is to send trained salesmen to call on them—but this is expensive and it is slow, for these men are away from their offices a large part of the time.

The effective—and economical—substitute is the presentation of this sales story in the magazine that they read—the magazine that goes direct to their desk and that they take with them on the line—the magazine that they read thoroughly and in their leisure hours.

RAILWAY ENGINEERING AND MAINTENANCE IS READ BY MAINTENANCE OFFICERS OF ALL RANKS



Worn Joint Bars Are Reclaimed at a Saving under Oxweld Procedures

WORN joint bars, when left in the track, contribute to track deterioration and soon become unreclaimable. The most economical method of renewing joint bars is to build them up by oxy-acetylene welding to provide a made-to-order fishing surface.

Improved Support

Under Oxweld procedures, joint bars can be rebuilt on the ground where they are to be reapplied; or bars can be shipped to a central point for restoration when field work is not feasible. Reconditioning the worn surface effects a substantial saving and provides a better support to the rail than could be obtained with new straight bars.

Lower Maintenance Costs

Rebuilding worn joint bars is one of the many procedures developed by Oxweld for the benefit of American railroads. Through the utilization of these improved methods, railroads are achieving lower maintenance costs and bringing higher-quality service to their customers. The Oxweld Railroad Service Company, Unit of Union Carbide and Carbon Corporation, Carbide and Carbon Building, Chicago and New York.

No. 114 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING CORPORATION
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Our Lead Editorial

June 1, 1938

Dear Reader:

"I have been so greatly impressed with the truth and forcefulness of the editorial in your May issue, dealing with the fundamental relationship between shippers, owners and employees in railway matters, that I want to express my appreciation of this editorial and of other editorials of similar character that you are publishing from month to month in Railway Engineering and Maintenance. These editorials give we railway employees a better understanding of the problems and of the difficulties confronting our industry today and help us to anticipate and to co-operate in those measures which our managements are taking to promote our industry."

Thus read a letter that I received a few days ago from a long-time reader. It directs attention to a phase of our service to you in which I have long taken a great deal of personal interest. For more than seven years you have noted that we have devoted our lead editorial in each issue to the discussion of the broader problems of the railways. We have done this in the belief that you desire to have basic facts regarding the industry with which you have cast your lot. More largely than in any other industry, men enter railway service because the work appeals to them rather than merely to get a job, and after they are once in it they remain in it because it grips them. They are a part of the industry; they take pride in it; they are interested in its welfare.

In recent years the railways have not been doing so well. They have suffered from the decline in volume that is common to all industries; they have suffered also from conditions that are peculiar to the railways, including the subsidization of competing agencies with public funds, the restriction of initiative through public regulation, etc. The full effects of these added handicaps are not readily apparent even to those within railway circles. It is our aim to point them out from time to time.

The public is friendly to the railways today—more friendly than for a generation. It is receptive to facts regarding railway difficulties; these facts can be demonstrated most effectively within one's own community through contact of neighbor with neighbor. It is our hope that the information that we are bringing to you in these editorials receives wide dissemination in this way.

Still more important in our mind is the desire to demonstrate that the railways and the employees have much in common—that they have more to gain from co-operation in the solution of their mutual problems than they have by controversy and bitterness over those problems where their interests may appear to differ. If we can contribute to a better understanding of the mutuality of interest between the railways and those who work for them, one of our major objectives will be attained.

As I said above, I have been glad to receive this letter as I have been glad to receive other evidences of the use to which these editorials are being put. They are being quoted more widely than any other column in Railway Engineering and Maintenance. We hope that you are finding these editorials of practical value to you.—That you are using them in the way that will contribute most largely to the upbuilding of the railway industry and thereby to the furtherance of your own interests.

Yours sincerely,

Elmer T. Howson

ETH:EW

Editor

MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

The ambulance rushed to the scene . . . it's a tool accident . . . a man is hurt . . . the railroad pays. Yes, not only for medical care but damages! Such accidents cost far more than the savings exercised by using inferior low first-cost tools.

However, you can save by using Devil Tools that have longer life . . tools that are safe. They are made of controlled alloy steel that has uniform structure to the core. Devil Tools are precision heat-treated and individually inspected for structure, weight, and design. This combination of manufacturing and inspection gives you tools that will not chip or spall . . . tools with economy through long life, plus safety.

Railroads that have been depending on the Devil Line of Track Tools have facts and figures that show there is no equal for this line of tools. They put them in the hands of their road gangs with full knowledge of their safety. Investigate the possibility of using the Devil Line on your road—investigate the savings and safety they give.

WARREN TOOL CORPORATION

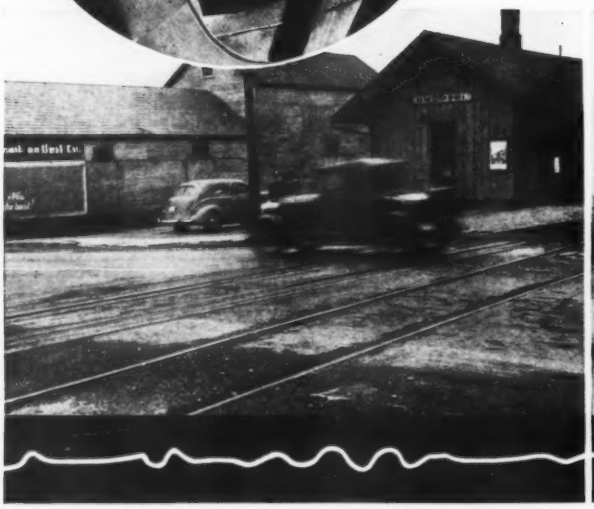
WARREN • OHIO

"RIDE-O-GRAPH"

registers approval of

TRUSCON WELTRUS HIGHWAY CROSSINGS

At left: Testing highway crossings with the "ride-o-graph" a seismograph-type instrument which traces a line on a roll of sensitized paper to register roughness or smoothness of highway crossings.



Ride-o-graph record of bumps and jolts suffered by motorists when riding over the moderately rough highway crossing illustrated above.

Ride-o-graphic record of the typically smooth riding comfort of motorists passing over the Truscon Weltrus Crossing illustrated above.

Contrast the "ride-o-graph" record of the rough crossing (at left) with the Truscon Steel WELTRUS Crossing (at right.) Which is the liability, which is the asset in relation to public good will toward railroads? • Train travelers are usually car owners. Certainly every motorist is a prospective user of railroads with their improved safety, comfort, speed and economy. Good will or ill will pop up in many places. Every highway crossing is one of those places. • Investigate the *investment* advantages of Truscon Steel Highway Crossings. Their cost on an annual basis spells economy of highway crossing maintenance, improvement of safety conditions and protection of public good will. Our engineers will co-operate in your investigation. As a starter, send for illustrated catalog of Truscon Steel WELTRUS Highway Crossings.

TRUSCON
Steel company
YOUNGSTOWN · · · OHIO
57 SALES ENGINEERING OFFICES
SUBSIDIARY: REPUBLIC STEEL CORPORATION

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

JUNE, 1938

Published on the first day of each month by the

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 West Adams Street, Chicago

NEW YORK
30 Church Street

CLEVELAND
Terminal Tower

WASHINGTON, D. C.
1081 National Press Bldg.

SEATTLE
1038 Henry Bldg.

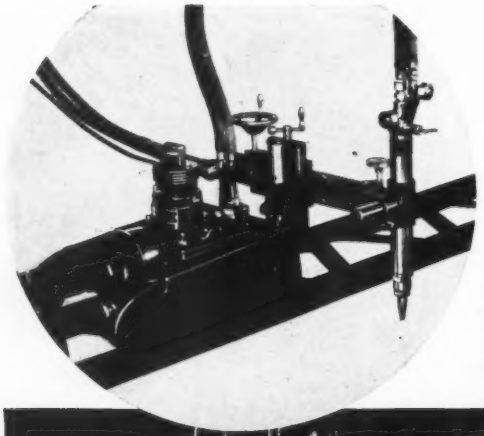
SAN FRANCISCO
485 California Street

LOS ANGELES
Union Bank Bldg.

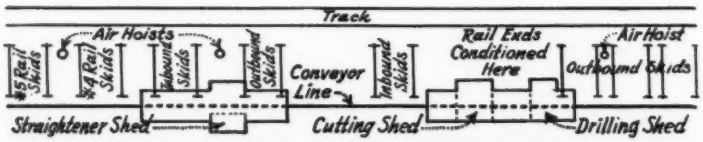
Subscription price in the United States and Possessions, and Canada, 1 year $2, 2 years $3; foreign countries, 1 year $3; 2 years $5. Single copies, 35 cents each. Address H. E. McCandless, Circulation Manager, 30 Church Street, New York, N.Y.

Member of the Associated Business Papers (A.B.P.) and of the Audit Bureau of Circulations (A.B.C.).

An example of efficiently organized RAIL RECONDITIONING



Diagrammed below is the layout of a large "straight-line" mass production rail reconditioning plant recently put in operation by a prominent railroad. A notable feature is the oxyacetylene cropping of the rail ends with a battery of motor-driven AIRCO-DB RADIAGRAPHS.



CLEAR TRACKS TO RAILROAD ECONOMY

Everyone of the following operations offers railroads the opportunity to cut costs. AIRCO is prepared to supply everything needed to perform one and all of them.

- AUTOMATIC OXYACETYLENE RAIL END CROPPING
- HEAT TREATING RAIL ENDS, FROG AND SWITCH POINTS
- WELDING UP RAIL ENDS
- OXYACETYLENE FLAME HARDENING
- OXYACETYLENE AND ELECTRIC ARC WELDING
- LOCOMOTIVE AND CAR SCRAPPING
- FLAME CUTTING LOCOMOTIVE AND CAR PARTS
- HARD SURFACING
- METAL SPRAYING

Full details about any of these operations promptly furnished on request. No obligation. Write for them.

There are two cutting stations so arranged that the back end of one rail and the forward end of the next are cut off simultaneously.

Each station has two RADIAGRAPHS, one over the other. As shown above, the upper RADIAGRAPH first cuts the top half of the rail; then the lower RADIAGRAPH, with torch pointing up, cuts the bottom half. Means are provided for accurate positioning and quick clamping of the rails.

The RADIAGRAPH cuts clean and true because every factor in the cutting operation is under *accurate mechanical control.* In addition to rail cropping, it is used for flame hardening rails, and of course, for cutting steel plate.

Our MW field engineers are ready to give you full particulars about the RADIAGRAPH and its uses—without obligation. Write for them.

AIR REDUCTION

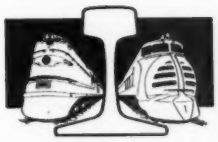
SALES COMPANY

General Offices: 60 East 42nd St., New York, N. Y.

DISTRICT OFFICES IN PRINCIPAL CITIES

SERVING RAILROADS FROM COAST TO COAST

Railway Engineering and Maintenance



Solvency

A Study of Income and Expenses

IN our last issue we directed attention to the relationship that exists between the three groups that are most vially inerested in the welfare of the railways—the public which desires fast, dependable and safe service at low cost; the employees who depend upon the railways for their livelihood; and the owners who invest their savings in the railways in the hope of securing a return commensurate with that which they can secure from investments in other channels. In that issue we pointed out also the growing disparity between the proportions of the earnings going to the employees of the railways and to their owners, and the fact that this trend, if not reversed, would inevitably lead to disaster.

Since these comments were written, the railway situation has not improved. Car loadings, the best index of general industrial activity and the current measure of railway earnings, are now 30 per cent less than a year ago and are, in fact, as low as at this season in any year of the depression. Employment has declined to the lowest level of the depression (maintenance of way forces are 25 per cent smaller than a year ago); and net railway operating income for the first quarter of this year was 71 per cent *less* than in the corresponding quarter of 1932 and 44 per cent *less* than in the same period of 1933, the two previous low years of the depression.

A Cut in Pay

Faced with this situation, the railways served notice on their employees during the month of a reduction in wages of 15 per cent, to be effective July 1. That they did not take this step willingly is indicated by the fact that it follows by only nine months their granting of an increase in wages, aggregating $135,000,000. At the time that this increase was granted many executives doubted the wisdom of the step but threw the decision in favor of their employees, hoping that traffic would increase sufficiently to enable them to earn and pay the increase. Later developments have demonstrated that their fears were by far more accurate than their hopes.

This action of the railways in moving for a reduction in wages brings each employee face to face with the fact that his interests are bound up with those of his employer. For this reason it becomes highly important for him to familiarize himself with the facts that have compelled his employer to reduce his income in order that he may be able to determine how best he can cooperate in correcting conditions and thereby improve his own lot.

The Burden of Debt

There are those in high positions in public life who are charging the difficulties of the railways to the "high debt burden" and who are urging wholesale financial reorganizations as the panacea. Yet 64 Class I railroads, with 132,000 miles of lines serving 24 states, failed to earn even their operating expenses and taxes in the first quarter of this year without any provision whatever for interest on indebtedness.

As stated in our last issue, the railways represent an actual investment in properties of $25,700,000,000, on which the Interstate Commerce Commission has, after exhaustive inventory, placed a value of approximately $22,000,000,000. Yet their funded debt is today less than $11,500,000,000.

Since the end of the World War they have expended almost $10,500,000,000 for additions to and betterments of their properties to make possible the most perfect service which the public has ever enjoyed. Yet if the bonded debt of the railways was scaled down to the amount so expended since the war and all of the investment made in these properties prior to 1919 were wiped out, the annual interest charge would be reduced only $37,000,000, or only half the amount that has been added to the expenses of the railways during the last three or four years by the levies for unemployment compensation and railroad retirement taxes alone.

Such a scaling down of railroad debt could be classed only as confiscation. Yet even such a drastic measure would accomplish little for the public. It is evident, therefore, that the difficulty that the railways are facing does not lie in the "burden of fixed charges," but that it is to be found in other, far more important channels.

Let us look at some other figures. For example, in the four years since 1933, the increase in the cost of materials and supplies used by the railroads, due to advances in prices since 1933, is estimated to total $275,000,000. Advances granted in wage rates of employees last summer have been estimated to add $135,000,000 a year more to expenses. The tax burden on the railways will be approximately $100,000,000 more this year than in 1933.

Again, reductions in rates for both passenger and freight traffic have cut down the railways' income. If the railways had received the same rates per ton-mile and per passenger-mile in 1937 as they did in 1930, their earnings would have been $800,000,000 larger than they actually were. When to these losses in income resulting from reductions in rates are added the losses in volume of traffic resulting from diversion to government-subsidized competitors, the total loss becomes tremendous.

From the above it should be evident that the railway problem arises from the conflict between lowered income and increasing expenses. It follows likewise that the solution must come from the restoration of a proper normal relationship between income and expenses. The desirable solution lies in building up income and the railways turned first to this alternative in their petition to the Interstate Commerce Commission for permission to put into effect a 15 per cent increase in rates. Failing to secure relief from this source, they have taken the only other alternative open to them—to reduce their operating expenses until such time as their income can be increased to the point where solvency can be maintained.

Track Maintenance

Can the Present High Standard Continue?

THE maintenance of way forces of the railways, in the face of almost unsurmountable difficulties, are continuing a remarkably fine job of track maintenance—in fact, it is amazing to many who are in a position to know, to observe the effectiveness with which the railways have stretched the maintenance of way dollar. That the railways are giving the fastest and most reliable service in their history, while at the same time maintaining the enviable safety record which they built up in the past, is testimony enough in this regard.

It is true that many millions of dollars of earnings were plowed back into the fixed properties of the railways between 1920 and 1930 in anticipation of heavier demands on the track, and that many roads, as a result, entered the depression period in good physical condition. It is true also that the still favorable condition of much railway property is the result of living off the fat of these earlier days, but to a far larger degree, the enviable record of the maintenance of way department in continuing to provide track which now affords the most satisfactory service ever offered by the railways, has been due to the ingenuity and untiring efforts of its officers and employees, and to the contributions to the efficiency and economy of their work made by an alert railway supply industry.

Another of the major observations of today's trends is the re-distribution of the maintenance of way dollar. In the main, the emphasis of maintenance of way work in recent years has been in the direction of better service and safety of train operation. As such, the major part of the maintenance dollar has gone into the track structure, especially into the higher-speed main-line tracks, to the neglect of tracks of lesser importance, and of many bridges and buildings where the factor of safety was not involved.

It could hardly have been otherwise, because even with the concentration of available maintenance money on the more important tracks, most main-line tracks have been maintained on what would have been considered a starvation diet only a few years ago. And herein is the principal basis for commendation of the maintenance of way forces, who, through ingenuity in the use of improved methods, organizations and units of work equipment, and the adoption of practices to stretch out the life of every element of the track structure, have continued to uphold their end in the face of largely reduced expenditures for every class of maintenance work.

Safety Rules

How Much Should They Be Emphasized?

IN THEIR efforts to reduce accidents among their employees, many railroads have issued rules governing the manner in which various tasks and operations are to be performed, and, generally speaking, a great deal of emphasis is placed on these rules. Without meaning to infer that rules are not a necessary complement in any safety program, one may raise a question as to whether too much emphasis on them does not help to defeat the purpose of the safety program by concentrating the attention of the employee on blind adherence to the rules without regard to other factors that may have an immediate bearing on his safety.

Obviously, it would be impracticable to try to govern by safety rules every motion on the part of the employee that is potentially hazardous. Hence, existing rules of safety are either of a general nature or are designed to apply to those operations and tasks that experience has proved most productive of accidents resulting in personal injuries. Thus it is conceivable that the placing of too much emphasis on these rules may have a tendency to divert the attention of the employee from the basic concept of the safety program, which is to maintain at all times a consciousness of the necessity of acting safely. In other words, the employee, if he is to be a safe worker, must be guided not only by rules but by a realization of the need of conducting himself at all times in such a manner as to insure the safety of himself and his co-workers. When this attitude has been inculcated in the employee he at once becomes a safe worker.

This whole question was brought into sharp relief recently when pictures depicting safety practices on one railroad were shown to a maintenance officer of another carrier. After a careful examination of the photographs the verdict of the officer was that several of them depicted

unsafe practices because they involved violations of safety rules that were in effect on his road. In its relation to the foregoing discussion this remark assumes special significance in the light of the fact that the railroad on which the photographs were taken consistently ranks high in safety performance.

Thus it would appear that, while rules of safety comprise a necessary and indispensable phase of the safety program, they are not the whole issue. Equally important is the need for creating in the mind of the worker an understanding and appreciation of the need for acting safely, even in the absence of specific safety rules.

The Crisis

Maintenance Men Will Not Fail

IT IS the cold truth, now appreciated more fully by railway men than ever before, that the railway industry, the industry upon which they depend for their livelihood, is facing a serious crisis. The factors which have brought this about were pointed out in our April issue and will not be repeated here. Steps are being taken to meet this crisis and there are indications from a number of directions that effective help may be expected. Whether this help will bring about the necessary relief in sufficient degree and with sufficient despatch to ward off still more critical conditions remains to be seen, but one thing is certain, and that is that under the conditions that now exist, employees in the roadway and structures departments, in common with employees in all other departments, must "roll up their sleeves" during the next few months, and tackle their problems with a vigor and determination unmatched even in the strenuous years through which the railways have already passed.

With an unprecedented amount of work desirable and necessary on the roadway and structures of most roads, but with far from adequate funds available for such work, maintenance men, on top of their remarkable record of recent years in "cutting corners" and effecting economies, must be prepared to pull in their belts still another notch and see their departments through. This will be doubly difficult in view of the stringent economies of the last seven or eight years, and the still-increasing service demands being made upon the track and bridges, but with an enviable record of meeting emergencies in the past, and a high degree of loyalty and determination innate in every seasoned maintenance employee, it is a foregone conclusion that they will not face the present crisis lying down. To meet it successfully will require foresight, ingenuity and a degree of scheming and planning not yet attained. In addition, the continued physical strain that will be called for will require a high degree of understanding and tolerance between officers and employees.

It will be a stiff uphill climb to come out of the present crisis successfully, but if the rank and file of employees and officers meet the test confronting them during the next few months while railway managements strive for effective solutions of the current problems of the industry, the chances for weathering the crisis, with a stable future ahead for both the industry and its employees, will be immeasurably increased. No one who knows the temper of maintenance of way men expects these forces to fall down. They have met other challenges successfully in the past. They will not fail to meet this one.

Track Inspection

As Important in Yards as on Main Track

WHEN track inspection is mentioned, one usually visualizes a track walker observing the condition of the main tracks. Yet, in many ways, the inspection of yard tracks is as important as that of main tracks, for interruptions to the flow of traffic through yards may be as serious in its consequences as if they had occurred on main tracks. Furthermore, protection against certain types of defects is provided, in part at least, on main tracks, by the signal system which automatically detects broken rails and open switch points; yard tracks have no similar protection.

Ladder tracks constitute the most important and intensively used element of a yard, and track defects on a ladder may slow down or interrupt the yard operation. For this reason, the yard inspector should be a competent trackman who is familiar with turnout construction and able to make emergency repairs either alone, or with an assistant if it is work that requires more than one man. He should be able to adjust switches so that the points will fit tight and throw easily.

Likewise, a daily inspection should be made of all incoming and departure leads and of all hump tracks, running tracks and tracks leading to or from the engine terminal, giving attention to every detail of track construction. He should be on the lookout for hazardous conditions, such as drawbars or other car parts that may have been left on or between the tracks by car repairers or switchmen.

In winter, snow and ice may interfere seriously with the yard operations, and it should be the duty of the inspector to inform the foreman immediately of any such obstructions. He should also ascertain whether snow-melting devices are functioning properly and that switches and guard-rail flangeways are being kept cleared of snow and ice.

In short, at all seasons of the year, track inspection in yards is highly important, and if the inspector is properly trained and has the right instructions, he becomes the most important man in the gang, rating in this respect only slightly below the foreman. In fact, no yard foreman can expect to be a complete success who does not have a competent track inspector, for he cannot oversee the work of his gang and at the same time attend personally to the multitude of minor details which must be looked after at widely separated points, or be in touch with all of the emergency work which arises so frequently in a busy yard. When the forces are reduced, the services of the yard inspector become still more valuable.

The fact that a foreman relies on his inspector to look after these details should not relieve him of any responsibility for the condition of his yard. He is merely conserving his time and providing for a daily inspection of the tracks, which he manifestly cannot make if he is to supervise the larger operations of his gang as he should.

Special Trackwork—

Its Design, Construction, Installation

THE importance of frogs, switches and crossings to the track man and the part that they play in his work and his costs were featured by four speakers in a program presented at a meeting of the Maintenance of Way Club of Chicago on March 28, at which G. J. Slibeck, Pettibone Mulliken Corporation, Chicago, presided. In introducing the speakers, Mr. Slibeck estimated the number of individual crossings in this country at 22,000*, involving an investment, at $1,200 per crossing, of $26,400,000. The number of turnouts was estimated at 239,000, involving an investment of $72,000,000.

Prior to 1929 he stated that the railways purchased about 3,000 crossings per year. Welding has since cut these renewals in half and of late the number of crossings renewed annually has dropped to about 700. Abstracts of the four papers follow.

Many Improvements in Design

By L. I. MARTIN

Morden Frog & Crossing Works, Chicago

IN considering the design and length of split switches, we must divide them into four general classes: (1) Main line turnouts for operation over the divergent route at the maximum practicable speeds; (2) main line turnouts and crossovers for operation over the divergent route at low speed; (3) yard turnouts; and (4) turnouts requiring frogs of a large angle.

The longest switch points are used in those turnouts where the highest speeds are desired. These points necessarily get severe usage and should be designed accordingly. They are commonly designed in one of two types, with many variations in fixtures and appliances—the split switch with graduated risers, in which the rails are elevated gradually by means of graduated riser plates until they reach the required height above the stock rails; and the split switch with uniform risers, in which the rails have a uniform elevation on riser plates for the entire length of the switch.

All main line switches for service under high speed or heavy traffic should be doubly reinforced for their full length, less angle bar clearance. Single reinforced and non-reinforced switches are used under lighter traffic and where operating conditions are less severe.

Some railroads have found that heat treated switch points result in a longer life to the thin end section of the point. Manganese-tipped switches can be used to advantage. The end of the switch point can also be made considerably heavier and stronger by bevelling off and under-cutting the stock rail, and planing the switch point to fit into the bevel.

Switch rods can be furnished rigid, although an adjustable rod has many advantages that should not be overlooked. Wear of points and rod fittings can be easily taken up in the adjustment. Throw of points can be maintained. There are many types of adjustable rods, the most generally used being the transit clip, the barrel

*Other estimates placed the number of individual crossings at 40,000. Purchases of "frogs, switches and crossings and parts of same" in 1937 were reported by the *Railway Age* as aggregating $12,566,000.

Welding Has Greatly Extended the Life of Turnout and Crossing Frogs

and Maintenance

Modern High-Speed Train Service Is Imposing New Demands on Trackwork

screw, and the eccentric clip. Switch plates vary considerably in design, including the pressed-up riser plate, the roller riser plate, and the solid milled riser plate.

Rigid rail braces of good design and sufficient weight of stock add considerably to the life of the switch and reduce maintenance costs. The latest and strongest design, giving the greatest latitude in practical maintenance, is the solid cast and adjustable rail brace. Adjustable rail braces permit one to take up wear and maintain accurate gage, which is essential in interlocking layouts.

Switch heel joints may be of either a four-bolt type with the bolts extending through the stock rail, or a four-bolt type with the bolts countersunk into the cast block. This latter type allows the stock rail to creep, which is desired by some engineers. A one-bolt type of spacer block is also used to a considerable extent by several major railroads. This block does not bolt through the stock rail, but is similar otherwise to the four-bolt countersunk head type.

The latest designs of split switches are curved throughout their length. This eases the entrance to the turnout and increases the permissible safe speed of traffic over the divergent route. The curved switch is necessarily made to the maximum length and minimum entrance angle at the end of the point. This specification results in a very thin ribbon-like switch point for a considerable distance from the end. Therefore, most installations have been designed with bevelled stock rails and with a heavier point.

Frogs

In the design of frogs, the first consideration is the angle or the frog number. The lower frog angles usually demand better construction because they are used more frequently in main lines with heavy traffic or high speed service. Main line frogs of the rigid type are made of open hearth, insert manganese, or solid manganese construction; spring frogs of open hearth construction. Open hearth rigid frogs are not generally used in high speed heavy traffic main tracks; the predominant design is the manganese insert type. In the higher angles, the rigid or self-guarded frog of open hearth or solid manganese design is used in yard or side tracks.

In spring frogs, it has recently been found practical by many railroads to place the short point on the main track side, cutting back the end of the point to ½ in. or more in thickness, and bevelling it down at the end. This design has decreased the amount of breakage in short points. The spring rail has been revised, in reference to the planing of the base, to eliminate all sharp corners and leave a maximum amount of base on the spring rail. This also has been found to decrease the frequency of breakage in the spring rails. An anti-creeper steel toe block is recommended as a preferred design for holding the spring rail in place.

For the heavier types of frogs a shock absorber has been attached to the spring rail, which holds this rail open while the train is passing through, and closes it after the last wheel has passed, with no hard blow on the frog. This construction definitely increases the life of the frog. The length of the toe arm on the spring rail has been shortened; and heavy tie plates with welded two-bolt clips, shock absorber, and other improved construction details have been incorporated in a new plan designed for the approval of the American Railway Engineering Association at its next meeting.

In manganese insert frogs, and those of solid manganese as well, an extensive investigation has been made by the Manganese Track Society and the American Railway Engineering Association to determine the cause of failure in the castings. This investigation developed that, particularly in the higher and heavier rail sections, the bolt shroud caused a segregation of metal over each bolt, which in-

variably left an internal shrinkage that could not be detected until the frog had received considerable service wear. To overcome this difficulty, all bolt shrouds and rib bracing are being removed from the under floor of the casting and an "S" shaped rib, unattached to the lower floor and bracing the side walls, has been adopted. This produces a uniform section throughout the casting and will definitely increase the life of the frog.

In the self-guarded frog, it has been found that solid manganese gives better service and requires far less maintenance than the open hearth rail design, with its many loose parts.

Crossings

The angle of the crossing and the amount of traffic definitely control the design for the most economical installation. Open hearth construction is used most extensively, and when reinforced with easer rails and continuous fillers, and well supported with large corner plates or continuous plates, will give considerably more service than the two-rail design, and also reduce the maintenance cost. Very satisfactory service has been reported by some railroads with the open hearth design where the running rails and through fillers have been heat treated, this design being used most satisfactorily on crossings of the butt type. However, where traffic is heavy and fast, manganese construction is preferrable. Solid manganese is generally used on the higher angles, and the built-up manganese insert design on the lower angles.

Crossings, especially where high speeds and heavy service prevail, should be double-guarded throughout, with the guards extended to protect the end frogs fully. There are several special designs that are preferred by some engineers; as, for instance, the solid manganese articulated type and the solid manganese type, with various designs of under-support, ribbing, and patented designs, for which various service advantages are claimed. There are designs which are tie-plated throughout, having welded stops and continuous gage plates covering all four tracks to hold both tracks in alinement, at a minimum maintenance cost. For special locations in heavy fast traffic on single or double curves, special track work designs are generally prepared by the manufacturer and are sent to the railroad for approval before fabrication.

Details of Construction

By A. F. HUBER

Chief Engineer, Ramapo Ajax Corporation, Chicago

THE production of frogs and switches consists mainly in the machining or forging of rolled shapes which have been produced by others and the finishing of rough castings received from foundries. Practically all of this work is done on machines, of which a completely equipped frog shop requires a large number, many designed especially for this purpose.

It is necessary to carry a large stock of material, even in periods of low production, because most of our items are rolled to our specifications and cannot be secured unless a considerable tonnage is specified. Thus a number of rail sections used on less important tracks are rolled for our industry only, as the railroads have not purchased these sections for years.

Following is a list of the items carried at our Chicago plant, which I believe is representative of other large plants. Thirty sections of rail weighing 56 lb. and heavier; 106 rolled steel sections for use as fillers and reinforcement for these rail sections; 186 items of bar steel, varying from ¾ in. by 1¾ in. to 1¼ in. by 8 in.; 917 different items of bolts of various lengths, diameters and shapes. Other items consist of large plates for crossings, heavy rounds or squares for forging clamps, switch stand spindles and connecting rods. Smaller items, generally termed Hardware, include spring washers, cotters, special nuts, fibre insulation, etc. All told, there are 2,200 different items in our stock books, not including special castings and other articles required for particular orders and not carried in stock.

Forming a Switch Point

In making a switch point, a rail is taken from the stock pile and sawed to the specified length, after which the reinforcing straps are clamped in position. It is then sent to a multiple spindle drill where all the holes are drilled in a single operation, after which the straps are riveted. The rail is then sent to the rail bender where it is side-bent, and the vertical bends, if any, are also put in. It is then ready for planing, where the procedure in most shops is to plane the flange, the stock rail side of the head, the gage side of the head, and the top, in the order named. Although the rail is securely clamped in the jigs while planing, it is distorted slightly in these operations, and it is necessary to return it to the rail bender for final straightening. After this, the sharp edges, particularly at the point, are removed by grinding.

In building frogs, a similar procedure is followed; this is, the rails are sawed, drilled except for the body holes, and bent and planed to the proper angle. The rails are then assembled with the fillers by means of clamps and sent to the large multiple

A Double-Track Bolted Crossing, Test-Assembled in a Modern Frog Shop

Solid Manganese Crossings Are Adapted for Use Under Fast Heavy Traffic

spindle drill, where the body holes are drilled through the assembled frog. The frog is then bolted and the plates, foot guards and other accessories are added. In manufacturing frogs and switch points, production methods are generally followed, though this requires that detailed information and accurate templates be given the men for the various operations.

Similar methods and machinery are used in preparing the rails for crossings, but because of variation in the size of rolled parts, these must be measured carefully before final machining and assembling. The building of crossings is a "tailor-made" job and to be certain that a crossing will fit in the track, it is necessary to assemble it completely and carefully check the alinement, the surface, gage and the flangeways of each track, as well as the angle and arm lengths, before it is taken apart for delivery to a railroad.

The preparation of manganese castings for frogs and crossings requires different methods and machinery, as the only way to remove excess metal here is by grinding since there is no tool hard enough to cut this metal. This is a difficult operation and requires skilled workmen to finish manganese castings in a satisfactory manner.

Forgings Are Required

One of the most interesting departments is the forge or blacksmith shop where rolled shapes are sheared into blanks, which are then heated in gas or oil furnaces and forged or formed into desired shapes. The forgings consist of guard rail clamps, switch stand spindles and connecting rods, heavy switch braces and corner braces for crossings. Clips and stops for switch points, metal foot guards, stops and hold-down housings for frogs are the principal items produced by forming. Production methods are necessary since the placing of dies in the machines requires considerable labor, and it is often a serious problem to decide how many pieces should be forged for stock when it becomes necessary to make a few of an item of limited use.

Close inspection of the work in process and of the finished product is necessary because of the possibility of error or misunderstanding in making so many and varied items. In our company, the shop inspectors report to the engineering department as this places the responsibility for both the design and the finished product in the one department which is most familiar with the customer's requirements and the usage which the article receives. In this organization, the engineering department is able to set up tolerances and specifications and see that these are maintained. Most items are also inspected by customers and closer limits and finer workmanship are being required from year to year. This is natural as the units are becoming heavier and more expensive, and instead of scrapping material after the surface has become worn, the railroads are now restoring the surface by welding and are obtaining considerable additional life from the unit.

Installing a Crossing

By M. D. CAROTHERS
Division Engineer, Alton, Bloomington, Ill.

THE type of crossing I will consider will be of an angle between 50 deg. and 90 deg. When the storekeeper receives the shipping notice for a crossing, it provides for delivery at the station nearest the point of application. In the same mail, the division engineer receives two blueprints from the manufacturer, giving the diagram of the crossing, the number on the crossing arm and the connecting rails. One of these prints is given the track supervisor who inspects the crossing after it is unloaded, and gives the section foreman instructions for assembling the arms and plates, if they are fastened by clip bolts.

All crossings are ordered with certain plate details which should be checked to determine the tie and heavy timber layout. The A.R.E.A. plans give detailed layouts of ties for railroad crossings. Layout No. 2, which is used most often for high angle crossings, calls for two heavy timbers or ties bolted together, of a minimum width of 18 in. and long enough to support the arms of the crossing, and laid longitudinally with the line of heavy traffic. Layout No. 3 requires only standard crossties spaced about 20 in. center to center.

Requires Careful Work

Since all crossings are laid out and built very precisely, it is well that the alinement be checked in the field before the crossings are installed. Center line stakes should, therefore, be located accurately so that the first crossing will be set in the right location. If the first one should be set off line, the entire set will be difficult to install, time will be wasted and much hard work will be lost.

The Use of a Locomotive Crane Simplified the Renewal of a Large Number of Turnout Frogs Within This Interlocking Plant Area

Before installing a crossing, it is often desirable to arrange for a meeting of the officers who install the crossing with the superintendent or trainmaster of the foreign line, to perfect plans for handling traffic with as little delay as possible to each road. A good interval to allow is about 1 hr. 30 min. per diamond or about 6 hr. actual working time for a set of four crossings.

A railroad crossing can best be installed by means of a locomotive crane, with a good foreman and 10 to 12 men. The foreign road should have a foreman and four men on hand to provide expansion, to make necessary connections and to smooth up the approaches to the crossing, if necessary.

The Procedure

As soon as the dispatchers can spare the tracks, the first move is to remove the old crossing, prepare the roadbed for the new ties or timber layout and also remove enough of the old ballast to give the new layout a fresh cushion. If there is a drainage system under the crossing, it should be checked to insure that it is working, or repairs made. As soon as the ties or timbers are placed, the first diamond is set and the arms connected to the approach rails. The next operation is the removal of the second old crossing, the placing of the ties and the installation of the second diamond. If this crossing is of a two-rail design, it is necessary to insert connecting joints between the two crossings, as there is a filler block which must be driven back to clear before the crossing is placed.

In past years, before safety was given so much consideration, the foreman used an angle bar with a bolt through the third hole, placing one end against the filler block and holding the angle bar down with his foot. Four men with short pieces of rail then hit the other end of the angle bar, driving the filler block to place. This operation is now done by the use of wedges to release the filler block and it is moved by means of a lining bar. In this way, two men now accomplish what formerly required five men, and do it more safely!

After full spiking and full bolting all connections, enough ballast is then unloaded to enable the crossing to be tamped properly and the gang surfaces the crossing and lines the tracks on the approaches. After unloading the ballast, the crane should load the old crossings, clearing the site of all scrap material. The section gang should then spend some time resurfacing and dressing the ballast as the life of the new crossing depends on how well it is maintained for the first few weeks after its installation.

The Problems of Maintenance

By G. P. PALMER
Engineer Maintenance and Construction,
Baltimore & Ohio, Chicago Terminal, Chicago

DURING the 33 years that I have been connected with railroad maintenance, many improvements have been made in trackwork. The use of special steel alloys and improvements in design have increased the life of frogs and crossings and thereby helped reduce the cost of maintenance. Also the introduction of welding has materially lengthened the life of frogs, switches and crossings and further reduced maintenance expense. There is another factor, however, which is tending to increase cost—the increased speed of trains, both freight and passenger, for safety and comfort require much higher standards of maintenance where higher speeds are required.

High-Speed Turnouts Require Sturdy Construction

The tendency today seems to be away from the bolted frog because of the many wearing parts that require more frequent inspection and repair, and thereby increase maintenance costs more than sufficient to offset their lower first cost. Frog bolts, where used, should be kept tight to eliminate, so far as possible, the movement under traffic of parts which may cause breakage. Good ties are essential under frogs, particularly at the toe, heel and point, and proper gage should be maintained to reduce excessive wear.

The welding of points and other parts where the wear is greatest will assist greatly in prolonging the life of a frog. Such welding can be and has been done at least four or five times in the life of one frog, at small expense compared to the cost of a new one. Here again the question of speed enters the picture. Some frogs that are worn to a point where they are no longer safe for high speed can still be used in slow speed tracks and should not be discarded or scrapped.

The switch point is the element of a turnout that requires the most frequent renewal; it is the source of most of our troubles, because derailments occur more frequently at switch points. There have been fewer changes in the design of switch points than in other parts of a turnout.

Frequent and careful inspection of switches is essential. The bearing under the heel of the switch is important and, of course, the stock rail must fit the point in service. The use of switch point protectors where traffic warrants has been of great help in prolonging the life of switch points. The welding and retipping of points can be recommended under certain conditions. Here again, switch points which have outlived their usefulness in main track can often still be used to advantage in back tracks and little-used side tracks.

Crossings

Railroad crossings are becoming one of the most important factors in maintenance costs because of the greater demand for smooth and safe riding crossings under high speeds. It has been demonstrated that the maintenance of crossings increases

rapidly as speeds increase. This has been partly overcome by improvements in design but these improvements have, in most part, materially increased the first cost of the crossings. On the other hand, improved design has increased the life of crossings, even under the greater speeds; the use of welding has further extended their life.

Good Maintenance Essential

Regardless of design, it is essential that all types of crossings be well maintained. Good drainage, good ties and good line and surface are most important. The use of anti-creepers adjacent to crossings is almost always required to maintain proper alinement. Where bolts are used, they must be kept tight and gage should be checked frequently and adjusted when necessary.

When I took charge of maintenance on the Baltimore & Ohio Chicago Terminal in 1912, I found a record of crossing renewals that had been compiled since 1902. It was soon evident why this record was being kept, as we had more than 200 individual crossings to maintain and this cost was a very large part of the total maintenance outlay. We had crossings in high speed tracks and in those with medium and low speeds; on sharp curves, in industry tracks and under a wide variety of traffic and loading conditions. It was evident that something had to be done to reduce this cost and that each location required individual study to determine the requirements at that particular location.

Comparative Life of Crossings During Three 10-Year Periods, 1907 to 1937

Location	Diamonds	Conditions	1907 1917	1917 1927	1927 1937
A	4	Medium traffic—high speed	3 yr.	4 yr.	6 yr.
B	6	Same as A	2½ yr.	5 yr.	6 yr.
C	4	Heavy traffic—high speed	2½ yr.	4 yr.	6 yr.
D	4	Same as C	2 yr.	3½ yr.	5½ yr.
E	2	Medium traffic—low speed Curve	2 yr.	3½ yr.	10 yr.
F	14	Same as E, except straight	3 yr.	8 yr.	Still in track since 1926

The crossing renewal record was kept up and became a guide as to what we needed to do. This record is now 36 years old and will be of interest in showing a part of what had been accomplished. Because of grade separations and other changes, the number of diamonds now maintained has been reduced to about 160, but is still large enough to remain a real problem.

For comparative purposes, I have prepared the accompanying table, which shows the life obtained from crossings, under varying conditions, during three 10-year periods.

This increased life of crossings has been secured in spite of heavier loads, increased speeds, and the same or a larger volume of traffic, but the increase in life has not been as great where traffic is heavy and the speed high.

Increased life means savings in maintenance costs; it has been accomplished by the use of heavier sections of rail; by the adoption of manganese construction of both solid and built-up types of frogs; by the use of heat-treated rail and bolts, of special designs; and by the use of both electric and acetylene welding as required.

Making a Safety Record

THERE is keen competition between roads, as well as between departments or regions on individual roads to make the best possible safety records. That this competition is laudable is recognized by both employees and management. Yet, there is always the danger that the basic purposes of the movement may be lost sight of in the enthusiasm to outdo the other fellow.

In an address on Safety Records, at an A. A. R., Safety Section regional meeting, which was held at Denver, Colo., on February 18, W. H. Guild, executive assistant, since appointed general manager of the south central district, Union Pacific, said in part that a good safety record does not just happen; it is the result of education, training and the consciousness that comes from constantly looking out for things that cause personal injuries. The first requisite for a good safety record is that every officer must himself be sold on the value of safety. The second is an effective safety organization which has the backing of the management.

It is not uncommon for supervisors to overlook situations that come under their personal observation, which involve dangerous practices or unsafe conditions. Strange as it may seem, supervisors do not always see the things that are going on right before them, but a live safety agent will spot these practices and conditions, when making his periodic inspections.

No person deliberately permits himself to be injured, but there is always the inclination to take a chance. The employee who looks after his own safety and that of his fellow workers is the most effective exponent of safety that we have. Yet the educational part of safety work is important, and can best be accomplished by supervisors. They must, however, be constantly driving home the value of safety and must demonstrate to their subordinates the principle of safety. The reason for this is that we are always up against the human element, making it necessary that officers and employees alike shall exercise constant vigilance if we are to make a record of which we can be proud.

It is difficult to break up unsafe practices that have been acquired over a course of years. The first reaction of the person who is being corrected is that he can see no reason for changing practices that have been followed without personal injury, perhaps for years. It takes patience, but such men can usually be convinced that they have been taking risks, and can be converted to the safe way, if they are made to understand the purposes underlying safety work, and that they owe it to themselves, their families and their employer to work in the safest manner possible.

A good safety record is of value, as it gives statistical information concerning the number of injuries that have occurred. Its real value, which lies deeper, consists rather of the fact that fewer men have been injured, loss of time by employees has been avoided and men have been kept out of hospitals, while suffering by themselves and their families has been prevented. This is the real dividend that is paid by a good safety record.

New Features

General View of the Enlarged Table at Windsor, Ontario, with its Steel Sheet Pile Pit Circle Wall —Insert Shows the Type of Center Used

TURNTABLES without wooden crossties, and turntable pits with steel sheet piling circle walls are the latest features of turntable construction on the Central region of the Canadian National, both of which features materially reduce construction costs and offer advantages in speed and economy in renewals. Other features of interest that are incorporated in the latest turntable renewal jobs on this region of the road are the use of timber pile supports for the circle rail, replacing the usual concrete type of support built integral with the back wall; and the substitution in the turntable centers of live rings, between which the conical rollers are confined, instead of the usual nest of conical rollers placed between the upper and lower treads, without restraining live rings.

While one or more of these features have been included in a number of turntable repair and renewal jobs on the region in recent years, they have all been incorporated in a recently enlarged turntable layout at Windsor, Ontario, where an old 70-ft. balanced-type table was replaced by an available second-hand 90-ft., balanced-type table released from a point where it was no longer required. Therefore, this article, while giving some attention to the various features individually, will confine itself particularly to their application to the Windsor installation.

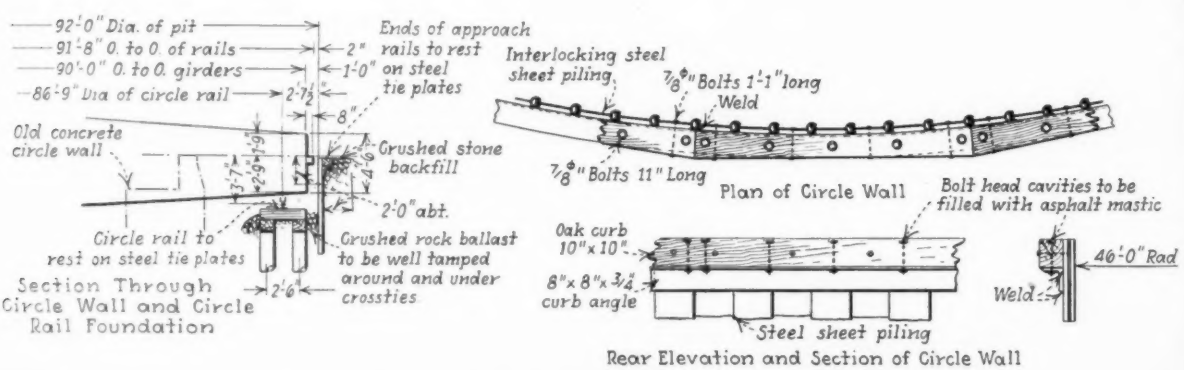
Economy Sought

The old table at Windsor, which served a 12-stall engine house, had the conventional type of deck system, consisting of stringers and floor beams, with wooden crossties supporting the track rails. The pit wall was of concrete, of usual design, which supported the circle rail within the pit, and the ends of the rails of all approach tracks on top.

In connection with the necessity for a larger table at Windsor, circumstances required that the work be done at the lowest cost consistent with the results desired. At the same time, in spite of the fact that the table could be taken completely out of service while the work was under way, it was desirable that the work be carried out in the shortest time practicable. These factors gave added moment to the various features incorporated in the enlarged table layout, all of which had already proved effective in reducing costs and in facilitating renewal work, or in improving turntable operation with reduced maintenance charges.

New Pit Wall

The new pit wall at Windsor is made up of 15-ft. lengths of second-hand interlocking steel sheet piling driven in a continuous circle of 92 ft. diameter, with a top elevation slightly below that of the base of the approach track rails. Directly back of the piling is a continuous coping, or curb, of 10-in. by 10-in. oak timbers,



Details of the Circle Wall Construction and Circle Rail Foundation

# of Turntables

on the Canadian National

The Central region of the Canadian National is installing steel sheet pile circle walls and pile-supported circle rails in connection with turntable enlargement projects. It is also eliminating all track ties on tables by supporting the rails directly on the steel deck stringers, adjusted to proper position to make this possible. The manner in which these features were incorporated in a recent turntable enlargement job at Windsor, Ontario, is described in this article.

built up of segments 7 ft. 10 in. long on their center lines, with each segment shaped and notched to provide a solid bearing against the webs of the piling. This timber curb, the top of which is level with the top of the piling, is bolted to the webs of alternate piles and has bearing on a continuous ring of 8-in. by 8-in. by ¾-in. angles, welded to the back of the piling.

This angle curb ring, which was pre-curved to exact diameter in the shop, is made up of sections approximately 30 ft. long, which were welded together in the field. The purpose of this ring is not only to lend support to the curb timber directly above, but, as will be pointed out later, being accurately shaped, it was employed as a guide or templet for the accurate driving of the sheet piling circle wall.

To insure the best possible foundation conditions for the approach rails at the pit, the space behind the new circle wall for a distance out and a depth of about two feet, was backfilled with crushed rock ballast. Furthermore, the approach rails were given bearing on double-shoulder tie plates, spiked to the curbing timber around the pit, and were anchored securely to prevent creepage.

The new circle rail, of 100-lb. section, has a treated timber pile support consisting of two concentric rings of piles, with the piles spaced radially 2 ft. 6 in. apart, and circumferentially about 6 ft. apart. Each ring of piles is capped with 12-in. by 12-in. treated timbers, set in as short chords of a circle, and the caps support 8-in. by 8-in. treated ties 3 ft. 6 in. long. The entire circle rail foundation is drift-bolted together. The circle rail itself rests on single-shoulder tie plates and is held in position by standard cut track spikes. A space on each side of and beneath the circle rail to the depth of the pile caps, is filled in with crushed stone ballast, insuring good drainage away from the timber.

The new lowered pit was excavated to a depth approximately 12 in. below final elevation, and was then filled in with crushed stone which was subsequently grouted to a relatively smooth paved surface. Drainage from this surface is provided to a low point in the pit, where the water is collected and carried off through a catch basin and a tile drainage line.

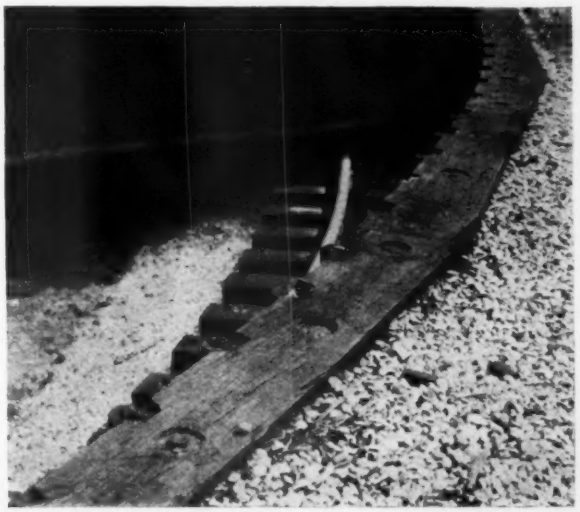
Features of the Table

The fundamental change made in the 90-ft. second-hand table used in replacement at Windsor was to adjust its deck stringers so that the track rails, at proper height, could be made to rest directly upon them, precluding the necessity for timber crossties. The two lines of stringers in the original table were spaced 6 ft. 3 in. apart, and were joined by riveted connections in the usual manner to the floor beams, spaced at intervals of 12 ft. 11 in.

In the alteration work, the stringers were moved inward to 5-ft. centers, and were raised approximately 8 in. to compensate for the depth of the ties and tie plates employed on the original table. This work, which brought the tops of the stringers above the tops of the floor beams, required the cutting away of the top flanges of the stringers directly at the ends, and also the adjustment of the floor bracing throughout. However, it permitted laying the table track rails directly upon the top flanges of the stringers, to which they were secured at intervals by fillet welds approximately 2 in. long.

At each end of both table rails, a run-off stop was provided to prevent the dropping of any wheels which might become derailed. This stop consists of an 18-in. length of 12-in. structural steel channel placed centrally beneath the rail end, with its flanges upward. These pieces are fillet-welded to both the stringers and to the track rails, holding them securely in position.

To permit walking about on the deck of the table with safety, 3-in. timber blocking was placed on top of the floor beams, and the entire deck between and outside of the track rails was floored with 2-in. plank, with open longitudinal joints to permit ready drainage. All of the structural

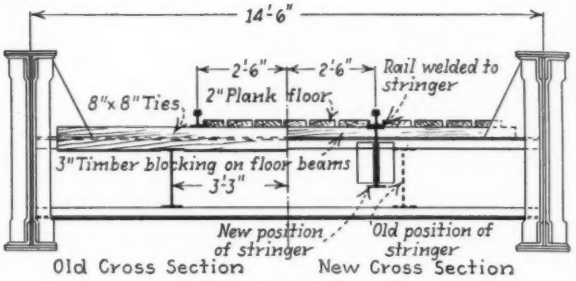


A Section of the Pile Circle Wall, Showing Details of the Oak Curbing

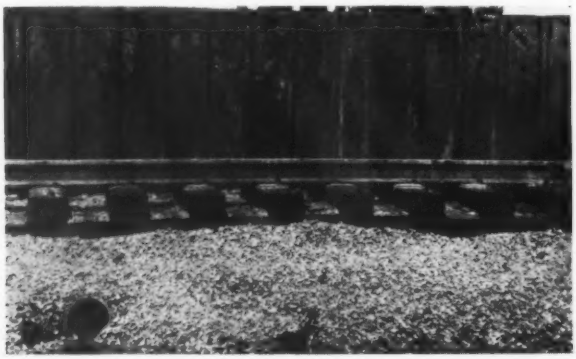
changes in the table were made in the field prior to setting it in position in the enlarged pit.

The turntable center employed with the larger table is a rebuilt roller-type center, in which the conical rollers, instead of being loosely nested in the bottom casting, have been assembled between two live rings, with each roller mounted radially on a 2-in. steel bolt, keeping it in true alinement at all times. The remodeled center provides for ready inspection and lubricating by means of removable, sectional cover plates, and the base casting has tapbolt-plugged drainage holes about its circumference to permit flushing it out as may be necessary to insure clean lubrication and thereby minimum resistance to operation and wear of the bearings.

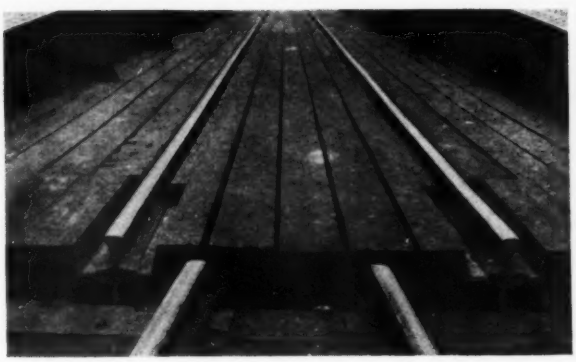
As already stated, the actual work of renewing the turntable at Windsor was carried out with the table entirely out of service. However, as will be evident from the construction method employed, all of the operations, with the single exception of changing out the old table, a matter of a few hours' time, could have been carried out in stages, permitting the old table to serve the engine house with little interruption. In fact, it is evident that the type of construction employed, exclusive of the alterations of the table itself, which can be effected entirely outside the limits of the change-over work, is conducive to rapid work under any conditions, except where the encountering of rock might interfere with the driving of the sheet pile circle wall.



Half Sections of the Old and Revised Deck Systems of the Table Installed at Windsor



Left—The New Circle Rail Is Supported on Two Rings of Short Timber Piles



Right—In the Modified Table, the Track Rails Are Welded to the Deck Stringers

The first operation in the Windsor work after the old table had been taken out of service was to remove all of the table approach tracks for a sufficient distance back from the old pit to clear the location for the new 92-ft. circle wall, and then to excavate to a depth of about 2 ft. a trench centered on the line of the new circle wall. When this had been done, the new 8-in. by 8-in. by ¾-in. steel curb angle was assembled in the trench in approximately its final position, and the ends of the several sections, already chamfered, were arc-welded together to form a continuous circle. With this work completed, the curb angle ring was blocked up to its final elevation on timber blocking, and was then adjusted accurately to a true circle about the turntable center. When in this position, it was anchored securely in place by means of "dead men" or short posts driven in the ground, in order to form an accurate, unyielding templet for the driving of the steel sheet piling circle wall.

Employing a locomotive-type pile driver previously spotted on the old table, the piling was then assembled and driven progressively around the inner face of the curb angle ring. In the initial placing of the piling, each unit was given only sufficient penetration to hold it securely in a vertical position until the entire circle had been completed. Then, moving progressively from pile to pile in a series of passes, the piling was driven to full penetration.

With the pile circle wall in position, additional excavation was carried out behind it to permit the welding of the curb angle to the individual piles. This welding, which was done by the electric-arc method, consisted of making ⅜-in. fillet welds along the top and bottom of the angle wherever it had contact with each pile. Following the completion of the welding, the 10-in. oak curb was shaped and bolted in position on top of the curb angle, which brought its top surface flush with the top of the sheet piling. Having completed the work on the circle wall, the excavated area behind it was backfilled with crushed rock ballast, and the approach track rails were brought up to their tie-plated bearing on the new timber curb.

Placing Circle Rail

Following the completion of the new steel circle wall all of the soil between it and the old concrete circle wall was excavated, employing a crane-mounted bucket loading directly into cars placed on the pit approach tracks. When excavation had been carried down to a depth of approximately two feet below the final base level of the new circle rail, the pile foundation for the new circle rail was driven, capped and provided with ties. Having completed this work from a position on the old table, the pile driver was removed over temporary timber cribbing to one of the approach tracks. A crane was then employed to pick up the old table in sections and to load it into cars, the old table having been unriveted and temporarily bolted previously to facilitate

(Continued on page 378)

Assistant Foreman—How Important in Yards?*

By Arthur H. Peterson

Roadmaster, Chicago, Milwaukee, St. Paul & Pacific, Chicago

A YARD gang in a terminal of any size should include one assistant foreman the year round. Others should be added whenever the size of the gang is increased to more than 15 men. One foreman cannot successfully supervise the safety of more than 8 or 10 men in a yard. This is especially true in a busy terminal yard where cars and locomotives are, or seemingly are, on the move everywhere. The situation in this respect is aggravated if there are many grade crossings present.

Few roads assign timekeepers to yard gangs. For this reason a yard foreman must be his own bookkeeper. He must prepare the daily time sheets for his gang; make bills of lading and unloading tallies for materials shipped and received; he must make numerous reports, including daily material sheets, labor distribution, coal reports, ballast reports, crosstie statements, requisitions for material needed, fire reports, derailment and other accident reports, personal injury reports, inventories, and other regular or special reports as occasion arises.

Obviously, all of this work involves considerable time, for in many cases the information going into the reports must be obtained from a number of different sources. Sometimes it may consume the greater part of the day. While he is performing these duties that are extraneous to track work, who is to run the gang and supervise the actual work of maintenance? Obviously, it must be done by an assistant foreman.

Not a few roads have abolished trackwalkers. Where he does not have a trackwalker, the foreman must himself get over his switches, switching leads, engine tracks, and other important trackage daily to determine whether any condition has developed over night which might lead to a derailment. While he is doing this some one must be in charge of the gang. It is the foreman who plans the work, orders the material and is responsible for the condition of tracks, switches, etc., on the territory assigned to him; it is the assistant foreman who must be the actual gang leader on routine jobs. To do this, however, he must be able to perform any or all of the duties of the foreman, and perform them well.

Ordinarily, the assistant foreman lines up the tools for the day's work, examines them to make sure that they are in good condition or sees that they are not taken out. He sees that they are properly placed on the motor car. It is he who makes sure that the motor car is serviced and in good running order; who looks over the men as they come to work to see that they are wearing their safety shoes and that their other clothing will not invite an accident. The assistant foreman customarily acts as motor-car operator, so that in addition to other duties he must obtain line-ups of trains, whenever he uses the main tracks.

In many instances the foreman may not be able to be with the gang for more than an hour or two during the day. It follows that he must have an assistant foreman to perform the necessary supervisory duties during these absences. The territory allotted to yard gangs has been increased greatly during the last few years. It is not uncommon today to find yard sections containing as much as 60 to 90 miles of track, up to 400 or 500 turnouts and a varying number of crossings at grade. It can be understood readily that where rail, tie, crossing or other general inspections are being made, the foreman may be unable to give any time or constructive attention to his gang for periods actually running into weeks. Without a high-grade assistant the work of the gang can be carried out only with extreme difficulty and certainly with great hazard.

In a large yard a great deal of work comes up on short notice. Switches may be run through, derailments occur at the most inopportune times and rush orders received to water stock or transfer the loads from bad order cars. In short, a multitude of jobs which must be done on short notice are the daily experience of yard gangs. When one of these emergency calls is received, the gang may have a switch torn out with a limited time available for completing its renewal, or some other important work may be under way which must be completed regardless of other demands. Under such circumstances an assistant foreman is invaluable, as he can be sent with a detachment to do the emergency work while the foreman and the remainder of the gang complete the work which had been started previously.

Yard Maintenance Involves Many and Varied Operations, Frequently at Widely Scattered Locations at the Same Time

Yards of any size and those in terminals usually have a large number of industry tracks which are maintained at the expense of the industries. Many of the companies owning these tracks prefer to have the regular yard gang make necessary repairs than have them made by a contractor. In general, the assistant foreman is given the needed number of men and assigned to make these repairs. In the meantime, the foreman remains with the rest of the gang carrying out the routine work in the yard.

An assistant foreman is usually promoted to this position from the gang. He is, therefore, thoroughly familiar with the yard, with the type of work required and with the use of tools, for he himself has handled them. He is also familiar with the way work should be done and can demonstrate by ex-

* This discussion was submitted for publication in What's the Answer department in the November issue, as an answer to the question whether a yard gang should include one or more assistant foremen, and if so, what their duties should be. Because of its scope, it was withheld for presentation here as an independent article. For further discussion of the subject see page 842 of the November issue.

ample to new laborers the correct way to tamp a tie, to drive a spike or do any other of the many tasks which fall to the lot of a yard gang. If he has the proper qualifications for his job, he will pair off the men so that the green laborer is placed with one of experience; he is the "pusher" of the gang; and he sees that every man produces a reasonable amount of work and that no one shirks.

Valuable During Storms

During snowstorms, supervision is always at a premium. If the gangs and the work are well organized, the foreman will be in charge during the day and the assistant foreman at night. During continued bad weather, night shifts may be necessary for a week or two at a time. Obviously, during bad or long-continued storms, switches cannot be kept open unless a well-trained assistant foreman is available. In either event, it is likely that all or part of the gang on each shift will consist of new men, and it requires experienced men to handle casual labor such as is generally employed during storms.

In addition, it is not uncommon for the regular gang to be greatly increased during the period of the storm. To handle so many men effectively it is necessary to split them into smaller groups, using the most dependable laborers as temporary assistant foremen. The foreman is then able to move from group to group to insure that everything is going smoothly. He can thus keep in close touch with all phases of his assignment, for he will not need to spend more than a short time with each group. At night the assistant foreman should handle his force in the same way. At other times, the assistant foreman can be called out to make emergency repairs at night when the foreman cannot be reached temporarily.

When a yard gang is increased to 30 or 40 men, there should be not less than three assistant foremen. In surfacing tracks through yards one of them should renew the ties, the second should do the raising and the third should line and dress the track. Organized in this way, the foreman giving general supervision to the work, tracks can be overhauled in a remarkably short time. A similar arrangement for unloading and distributing rail for renewals, for the laying of the rail and the bolting, gaging and spiking, will facilitate the completion of rail renewal programs in the yard.

Assistant foremen are well nigh indispensable to large-yard and terminal maintenance organizations. When a man has demonstrated the right qualities and has worked in the capacity of assistant foreman a sufficient time to obtain the requisite experience, he ordinarily develops into the most desirable material from which to draw foremen as they are needed.

As he gains in experience, the assistant foreman in a yard, almost more than anywhere else, must develop a real sense of responsibility and a high degree of initiative. The few cents an hour additional which are paid for these positions comprise money well spent; it is a sum that can be lost many times over every day that there is lack of proper and adequate supervision. No group of men functions well without responsible leadership, and this leadership is the province of the assistant foreman for a large part of the time of yard gangs.

Locomotive and other cranes are employed extensively in yards and terminals. When one is in use an assistant foreman, placed in charge, will look out for the safety of the men and insure that the equipment does not stand idle. Train and switching crews are sometimes more interested in making a job last as long as possible rather than in keeping the power machine at work continuously. In such cases, the saving by having an assistant foreman with the crane may be very large.

More exacting inspections are demanded of trackmen now than ever before. Not only do larger power and faster trains require more of the foreman's time in looking over switches, crossings and main tracks, but similar requirements are made with respect to switches, ladders and running tracks in yards where all operations are being speeded up to harmonize with the shortened road schedules. For these reasons, the assistant foreman is assuming much greater importance than formerly.

New Features of Turntables

(Continued from page 376)

the work of its final removal on cars.

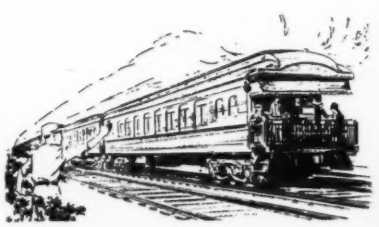
With the old table removed, men with air hammers cut down the old circle wall sufficiently to clear the underside of the new table, and, at the same time, the old concrete pivot pier was cut down as necessary and bush-hammered to the new final elevation required by the larger table. Following this work, final regrading of the pit was carried out; the new drainage system was installed; the remodeled table center was bedded on a ⅛-in. sheet of lead; and the new circle rail was set in place. The new turntable was then set in position, the circle rail was adjusted and spiked in place, and then, following such finishing operations as were necessary, the new and larger table was put in service.

Construction Economical

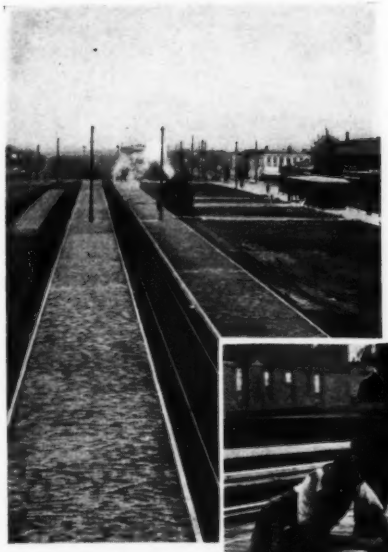
The actual cost of constructing the new sheet pile circle wall and the pile-supported circle rail, including all charges for material and labor and for the rental of equipment, was approximately $7,600, whereas a careful estimate indicated that the construction of a concrete circle wall for the 90-ft. table, with a concrete support for the circle rail, would have cost approximately twice that amount. No record for speed was made in effecting the table change at Windsor since the increased cost which this would have involved would not have been justified under the circumstances. However, it is contended by those in charge of the work that the method employed is much more rapid and flexible than other permanent types of circle wall construction, and can be performed more readily where the old table must be retained in service, with considerably less interference with normal operation of the table.

The advantages derived through the redesigned table with the track rails resting directly upon the deck stringers are to be found largely in the saving in the cost of the deck track ties, and in the reduced maintenance of the turntable track which is expected. It was recognized in the case of the redesigned table at Windsor, that the cost of the table changes largely offset the savings effected through the elimination of the ties, but it was felt that the changes were fully justified and will prove conclusively the advisability of incorporating the revised features in future new tables, where the full economy of eliminated cross-ties can be taken advantage of.

The work of enlarging the turntable at Windsor was carried out by company forces under the general direction of T. T. Irving, chief engineer of the Central region, and under the immediate direction of C. P. Disney, bridge engineer, Central region.



What Type Platforms?



Above—Brick Platforms — Right — Laying an Asphalt Wearing Surface Over Worn Plank

With platforms at stations, terminals and shop facilities among the most numerous of railway building facilities, the problem of the most suitable type of wearing surface to meet specific service requirements is one of importance to every railway. The following is a discussion of the relative advantages and disadvantages of various types of wearing surfaces for platforms, which was presented as a report before the recent annual convention of the American Railway Engineering Association in Chicago.

THE many types of platforms required on the railways may be classified generally as those at passenger stations, at shops and car yards, and at piers, warehouses and freight houses. Platforms at passenger stations are usually surfaced with wood, brick, concrete, pre-mixed or mixed-in-place bituminous materials, or with special products. Those at shops and car yards are generally surfaced with concrete, wood blocks or bituminous materials, while platforms at piers, warehouses and freight houses are of a wide variety of construction, including wood, concrete, wood blocks, bituminous mixtures, asphalt mastic on a concrete base, and metal plates.

Wood Used Widely

Wood is the most widely used material for surfacing railway platforms. If the wood is untreated, the most durable species, consistent with the requirements and costs involved, should be used. The cheaper non-durable woods, containing a large proportion of sapwood, give good service life when pressure treated with creosote or salt solutions. Sapwood can be treated more effectively than heartwood and its strength is the same.

For light traffic, treated softwoods give satisfactory results. Treated black gum resists wear and is moderate in cost. Greenheart, a tropical wood, is suitable for heavy-duty wearing surfaces because of its density and stiffness. It does not require preservative treatment and has long life.

As wood surfaces wear, their life can be extended by applying moppings of asphalt emulsions, dusted with sand. Such surfaces are durable when protected from the weather. These coatings should not be applied to treated wood until bleeding or leaching has stopped.

Brick and Concrete

Platforms surfaced with brick are used extensively and have many advantages. They are repaired easily and economically and the brick may be readily salvaged. For marking ing purposes, such as clearance lines, a light-colored brick may be used in conjunction with bricks of darker colors. The foundation of a brick platform should be carefully prepared and the surface brick should be of a type suitable for the service required. The brick may be laid on a smooth, well rolled base of cinders, gravel, crushed stone or slag. In addition to asphalt, coal tar pitch may be used in the mastic cushion and as a filler between bricks. When used as a filler, the asphalt and coal tar pitch should be poured hot into the joints between bricks. Where a cement and sand filler is used, it may be applied dry and wetted after placing, or it may be poured into the joints in the form of grout.

Platforms with concrete surfaces made of selected aggregates, properly mixed and cured, give good results under heavy service. It should be noted, however, that inattention to the requirements for making good concrete has been the cause of unsatisfactory results.

There are a number of special or patented concrete aggregates on the market designed to produce surfaces which will resist wear and the action of the elements. There are also many types of steel grids or grills which may be imbedded in the concrete to form an armoured surface against heavy duty.

The two methods of concrete platform construction in use are the one-course method and the two-course method. In one-course work, the base and topping are poured in one operation as a uniform slab. In two-course work, the base is poured first, by itself, and the topping, or wearing surface, is then placed before or after the concrete in the base has set.

The concrete used in platforms should be thoroughly compacted, but not to the point of bringing water or an excessive amount of mortar to the surface. If the water in the concrete separates, there is a tendency for the formation of a top layer on the concrete which has a high water-cement ratio, which is structurally weak and subject to greater shrinkage. Proper

grading of the aggregates and the proper proportioning of the mix will reduce the tendency for the water to separate out.

In concrete mixes for platforms, not more than 20 per cent of the total aggregates should be retained between two successive sieves of the standard set. At least 10 per cent of the sand should pass a Number 50 sieve to give sufficient fines. The volume of sand should not be less than one-third the total volume of aggregates nor more than one-half the total, based on surface-dry materials. Allowance for bulking on account of moisture will increase these proportions.

One-Course Construction

One-course concrete platform construction is usually finished with a gritty surface by hand floating. A vibrating screed is recommended for this purpose as it permits the use of a stiffer mixture and assures better compacting. Care must be taken not to vibrate the concrete to the point of causing a thick layer of mortar to be brought to the surface. Cement, or a mixture of cement and sand should not be added to the surface. If a smooth finish is desired, it may be produced by troweling after floating.

Cement-bound macadam may be used in one-course work by first spreading the aggregate in the thickness desired, then rolling or tamping, and then grouting with a cement-sand-water mixture and compacting.

Concrete Platforms Are Used at Many of the Newer Large Stations

The surface should be finished with a gritty texture.

Two-course construction is generally used for inside floors where a smooth surface is desired. The base is poured in the same manner as for one-course work. The topping should be composed of one part cement, one part sand, and from one and one-half to two parts of pea-size gravel or crushed stone graded from one-eighth to three-eighths inch. This mixture requires less water than other mixtures and is subject to less shrinkage. The coarser aggregate at the surface withstands the wear and any abuse.

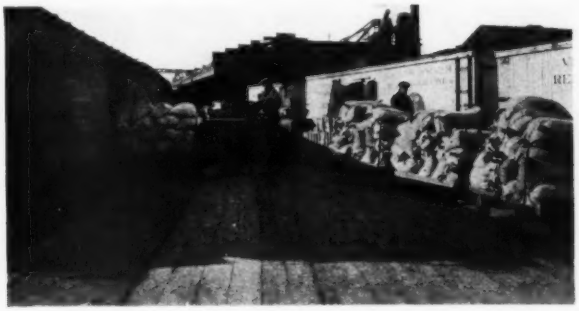
Silica, granite and trap rock are the most suitable for the coarse aggregate. Softer materials do not wear well. Sands containing stone dust, clay or silt are particularly objectionable. A topping of cement and sand mortar may be used and is easily spread and finished, but such a topping will shrink and will result in crazing and dusting, and will have poor wearing qualities.

A mechanical float consisting of a motor-operated rotating steel disc may be used for compacting. This type of float permits the use of a stiff mixture, which is desired since such a mixture reduces the tendency for water to come to the surface.

If the topping is to be laid after the base has set, the surface of the base should be finished rough and then wetted when it is to receive the topping. No pools of water should be permitted on the base when the topping is placed, and its surface should be covered with a neat cement grout mixed to the consistency of thick paint and thoroughly spread and brushed in.

A new concrete surface may be placed over an old concrete floor if the old floor is thoroughly cleaned and saturated with water for several hours before applying the new material. The topping should be about two inches thick and should be reinforced with wire mesh weighing 30 lb. per 100 sq. ft. Joints in the new topping should coincide with the joints in the old floor.

Wearing surfaces of bituminous materials are often used on platforms. The base course may be of cinders, crushed aggregates, or of mixed or penetrated concrete. The relative cost of this type of platform is low. The bituminous products employed may be natural asphalts, emulsified or cut-back asphalts, or coal tar. Some types of emulsified asphalts may be mixed with portland cement. Where these are used, the manufacturer's recommendations as to the methods of mixing should be followed to give the best results. Asphalt surfaces on mill-type or laminated wood floors have good wearing qualities.



Steel Plate Runways Are Sometimes Used on Heavy-Duty Wood Platforms

Where absolute watertightness is essential, or in locations subject to acid conditions, hot-type mastics should be used. These may be laid over concrete or on firm wood bases, and the manufacturer's specifications should be followed carefully. Furthermore, care should be taken to see that the correct type of mastic is used to meet the specific conditions involved, such as indoor or outdoor, light or heavy traffic, cold storage rooms, etc.

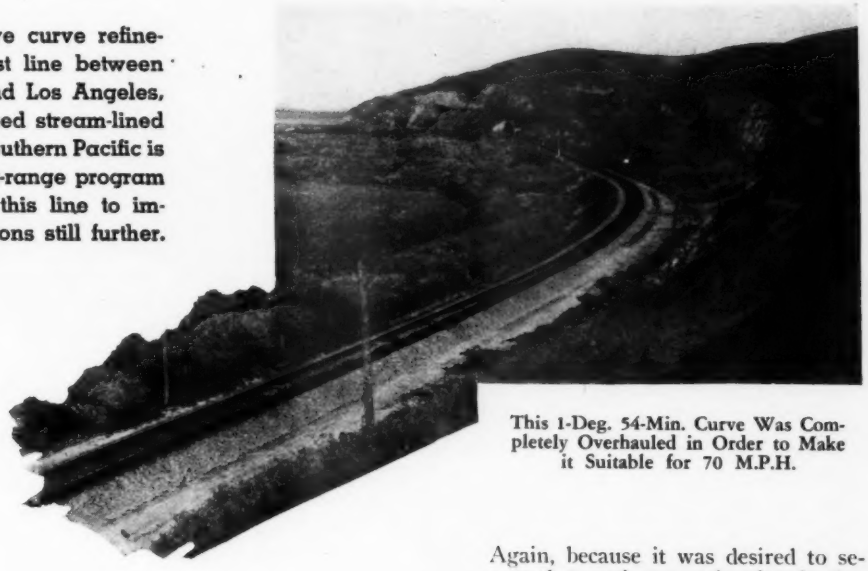
Treated wood blocks make satisfactory surfaces for floors in shops and storehouses, and for other locations where they will be protected from the weather and from excessive moisture. Wood blocks should be held in place by proper curbing, and care should be taken to provide adequate bituminous-filled expansion space between them.

Steel and Iron Plates

Wearing surfaces of steel plates are sometimes used on heavy-duty wood platforms. Where tractors are used, the plates should be not less than ⅛ in. thick, and should be embedded in a mastic cushion and fastened in place with countersunk screws. If the plates are used over a steel sub-structure, they should be welded to it and to each other. In such cases, the plates should be ¾-in. thick. Metal plates may also be laid over concrete. Iron plates with special checkered or roughened surfaces are sometimes used to provide better traction. Such plates are little affected by abrasion and corrosion, and have a long life.

Preparing for Higher Speeds

Supplementing extensive curve refinement work on its Coast line between San Francisco, Cal., and Los Angeles, the route of its high-speed stream-lined "Daylight" trains, the Southern Pacific is now engaged in a long-range program of curve reduction on this line to improve operating conditions still further.



This 1-Deg. 54-Min. Curve Was Completely Overhauled in Order to Make it Suitable for 70 M.P.H.

WHEN the Southern Pacific placed its "Daylight," high-speed stream-lined trains, in service on its Coast line, between San Francisco and Los Angeles, on March 21, 1937, it had relined 184 light curves and extended the spirals, bringing to completion the first phase of a more extensive program of curve revision, the second of which involves a reduction in the rate of curvature of a large number of curves, in some cases including revisions of alinement of considerable magnitude. The completion of this phase of the work on the date that the new trains were placed in operation, made it possible to reduce the previous schedule of 11 hr. between these termini to 9 hr. 45 min., thus increasing the average speed from 43 to 49 miles an hour.

Topography Is Rough

The Coast line of the Southern Pacific follows the Coast range of mountains or skirts the shore of the Pacific ocean for practically the entire distance between San Francisco and Los Angeles, passing through the Santa Lucia range between Santa Margarita and San Luis Obispo. Although there are several stretches of valley location where curvature is at the minimum, in general the ratio of curve to tangent is high through the rough mountain districts and along the somewhat irregular shore line. As a result of this broken topography, maximum permissible speeds have ranged from 30 miles an hour through the Santa Lucia mountains to 75 miles an hour in the valley sections.

While the curve improvement was undertaken primarily to permit a reduction in the running time of the stream-lined trains, and at the same time insure comfortable riding at the highest permissible speeds, and while the entire program includes all of the curve-improvement work that is considered practicable on this line, the work itself was divided into two classes. These were (1) that which could be done at low cost and required minimum disturbance to the alinement, thus being susceptible of rapid completion; and (2) that which required major disturbance to the alinement, in some cases necessitating complete line revision, requiring considerable time for completion and involving much greater cost than the projects included in the first class.

To Work Progressively

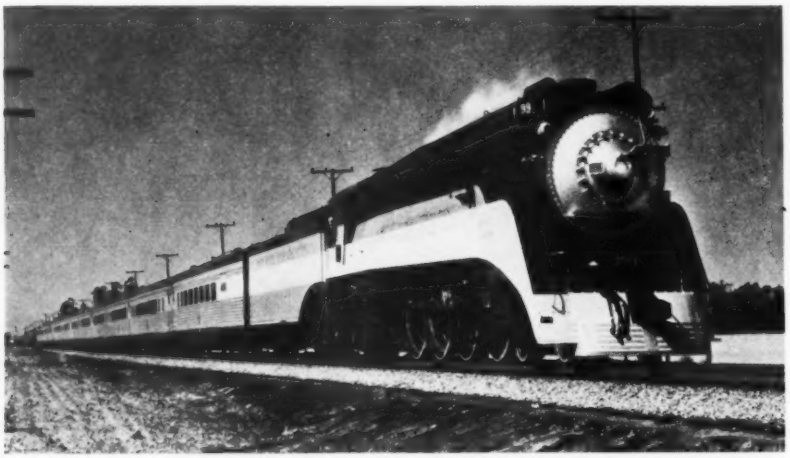
Since it was foreseen that all of the curve reduction work on this line that was considered feasible could not be done at once, the plan was developed to provide for progressive reduction in the running time of these trains. Again, because it was desired to secure the maximum ratio of reduction in running time to money expended, all efforts prior to the placing of the trains in operation were concentrated on the lighter work included in the first classification and this will be described, as only a minor amount of the work covered by the second classification has been done, although it is intended to carry this to completion as rapidly as conditions will permit.

Maximum Permissive Speeds on Curves

Degree of Curve	Super-elevation, in.	Maximum permissive speed, miles per hour	Length of spiral, ft.
0°31′	1½	95	167
1°00′	3	82	289
1°30′	4	75	352
2°00′	4½	67	354
2°30′	5	62	364
3°00′	5½	60	387
3°30′	5½	55	355
4°00′	6	53	373
4°30′	6	50	352
5°00′	6	47	331
5°30′	6	45	317
6°00′	6	43	303
7°00′	5½	40	258
8°00′	4½	33	198
9°00′	4½	32	198
10°00′	4½	30	198

In general, it was planned to carry on the first phase of the work in connection with rail renewal and ballasting, and in the main this was done. On the other hand, a considerable number of curves were completed independently of the rail program. These were selected carefully with the

idea of improving those already laid with heavy rail and which were well ballasted, to obtain the longest practicable stretches of high-speed track by improving the riding possibilities of the lighter curves between speed-restricted points. Between San Francisco and Santa Barbara, where the line leaves both the Coast range and the ocean shore line, 126 curves were improved, while 58 were completed between Santa Barbara and Los Angeles.



The "Daylight" High-Speed Streamlined Trains Have Made A Large Cut in the Running Time Between San Francisco, Cal., and Los Angeles

Primarily the work consisted of extending the spirals to give an easier approach to the curves at high speed, of relining to provide a smoother alinement, as well as to accommodate the new spirals, and of increasing the elevation to correspond to the higher speeds proposed and to insure more comfortable riding at these speeds. Heretofore, the railway taper curve has been standard on this as well as other lines of the Southern Pacific. While these tapers were satisfactory for normal speeds, they were too short to give a satisfactory approach for the speeds necessitated by the shortened schedule of the Daylight.

It was desired to limit the change in elevation on the runoff to 1¼ in. per sec., and under no circumstances to allow it to be greater than 1½ in., for which reason it became necessary to lengthen the spirals. Since the tapers in use do not have sufficient flexibility to meet the new conditions, the Talbot spiral (developed by Dr. A. N. Talbot, professor emeritus, University of Illinois) was chosen as having the requisite flexibility and most nearly meeting all of the conditions encountered. To determine the length of spiral to be applied to any curve it became necessary to know the amount of elevation to be given that curve and this, in turn, could be determined only after it was known at what maximum speed the trains were to be operated around it.

To make this determination, the line was divided into speed zones, the maximum permissible speed within each zone being established after thorough consideration of the physical characteristics, including the ruling curvature, the conditions of the roadbed, etc. The accompanyiing table was then prepared, based on the height of the center of gravity of the locomotives that were to handle the Daylight, the figures representing the maximum superelevation and the maximum permissible speed for each rate of curvature. The actual superelevation to be applied to the individual curves in each zone was then calculated and from this the length of spiral necessary to run this elevation off at the stipulated rate was determined.

Methods Were Simple

The method employed to insert the longer spirals on the curves was quite simple. Wherever practicable, the rate of curvature was decreased, but if it became necessary to increase the degree slightly to obtain the desired tangential offset, this was done without hesitation. It should be understood however, that this increase was never sufficient to have an adverse effect on the speed. On the other hand, some of the curves on this line have large central angles, in which case a change of even a minute or two in the rate of curvature sometimes affected the external distance sufficiently to require an unreasonable amount of throw at the ends or the midpoint of the curve. Where this condition was encountered the rate of curvature was not changed, but the curve was compounded near its ends to give the tangential offset needed to insert the spiral. The location of these points of compound curve was easily determined through the formulae for the transition curve. In all cases, spirals were introduced at points of compound curve.

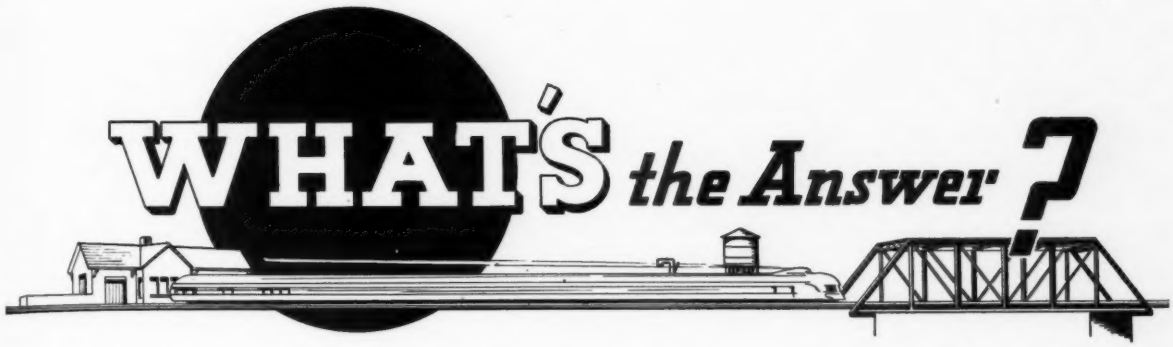
By following this procedure the maximum throw of the track rarely exceeded one foot, so that little bank widening was required. The important fact is, however, that after the necessary throw had been made the track was still supported on a stable roadbed, reducing later maintenance compared with track wholly or partly on new roadbed.

The curves were staked in the usual manner by parties consisting of three men. The points of spiral and of circular curve were marked by steel pins ¾ in. by 3 ft., with the center punched in the top. A zinc tag with raised figures indicating the superelevation was nailed to the tie at the beginning and end of all circular curves and at intervals of ½-in. change in the elevation on spirals, including the zero point.

Conventional methods of surfacing, providing the elevation and lining the curves were employed throughout.

Along the "Coast" Line, Near Harlem, Cal.

The surfacing gangs averaged 75 men each. The track was given an average lift of 1½ in. on the low side of the curve and all tamping was done with 16-tool pneumatic tie-tamping outfits. Throughout the work, traffic was maintained without interruption at all times and with minimum delay.



When Rail Becomes Curve Worn

When rail on curves becomes worn, is it more economical to transpose it or to lay new rail? Why? What considerations govern this?

Economy Plainly Evident

By Thomas Walker
Roadmaster, Louisville & Nashville, Evansville, Ind.

The economy of transposing rail is plainly evident, for by doing this the purchase of new rail can be deferred from one to many years, depending on the degree of curvature and the volume of traffic. The transposition should be made before the rail becomes too badly worn, however, for if the low rail becomes too badly flattened it may not be suitable for use on the high side. When the low rail is transposed it should be turned, as the curvature in this rail always reverses itself when it is released if it has been in service for any length of time. Except on very sharp curves, transposition will often extend the life of the rail until the tangents on either side must be relaid.

Some labor is also saved, since there is no new rail to unload or old rail to load. In some cases new rail is laid on the high side and the high rail is shifted to the low side, discarding the low rail. This is probably wise where the high rail is not badly worn but the low rail has been allowed to run too long. In general, it is better to transpose both rails, but it is questionable whether it is economical to make the second transposition, that is, of the high rail only.

This brings up the question of short rails on the low side, which injects some difficulty with respect to the transposition. It has been my practice to adjust the difference in the length of the rail around curves by laying short rails on the tangents so that the joints at the center of the curve will break properly. This simplifies transposition, since all rails on the curve are full length.

Lubricators Save Rail

By C. B. Bronson
Inspecting Engineer, New York Central, New York

In the past, transposition of rails on curves was a common practice, particularly on single and double-track having dense low speed traffic mixed with fast passenger traffic. This was rarely necessary, however, on tracks carrying principally high-speed trains. Lubricators have changed this situation on many lines, since flange wear is so greatly reduced by lubrication that frequent renewal of the high rail has become unnecessary. The distortion of the head of the low rail is now the limiting factor in curve wear. Obviously, however, there are still many sharp curves not yet protected by lubrication against rapid abrasion, as well as many curves of greater radius which for special reasons are subject to unusual wear. For these reasons, transposition of rail on curves is still a matter of active interest.

It is doubtful whether the economy of this practice has been definitely demonstrated by a comparison of the installation cost of a succession of new rails as the old ones wear out, with transposing the worn rails. It is also difficult to evaluate either method on a traffic-tonnage basis, which after all is the true criterion of cost. There is a limit, however, to the extent to which transposition can be carried out initially to derive any benefit from it. By this is meant that if the transposition is delayed

Send your answers to any of the questions to the What's the Answer editor. He will welcome also any questions you wish to have discussed.

To Be Answered in August

1. Is it necessary to patrol track daily in automatic signal territory? In non-signal territory? Why? If not, how often should it be patroled?

2. Can asbestos shingles or siding be used on a building that is subject to excessive vibration? If not, why? If so, how should they be fastened? In what ways can the vibration be reduced?

3. When laying rail, should the expansion shims be left in for a definite period, or should they be removed before the joint bars are applied? Why? If the former, for how long?

4. To what degree of accuracy can pile bents be driven? What methods can be employed to increase the accuracy of driving?

5. Should the joints be kept as tight on soft roadbed as on track that is well supported? Why?

6. What factors must be considered when the installation of a centrifugal pump is contemplated? What is the importance of each?

7. What methods should be employed to keep railway crossings in good line and surface?

8. What is the cause of fading of straight-color paints employed for trim and sash painting? How can it be prevented?

until the high rail is badly flange worn and the head of the low rail is seriously distorted and flowing, it will be a waste of time and effort to make it. Taken in the intermediate stages, some benefits are evident.

If the high rail is transposed, the cold rolling it has received will prevent lateral flow in its new position, while the narrowed head reduces friction. The low rail becomes fairly effective on the high side, since the distortion it has received does not reduce surface-bearing contact to any extent, and it has virtually full-head width to resist curve wear.

Where rail and flange lubricators are used, little advantage will be gained by transposing, for it is better to replace the low rail with new rail when it becomes worn, leaving the high rail undisturbed. The new rail immediately rids the track of dipped and battered joints, smooths out the riding quality of the curve and tends to stabilize the high rail. Joint batter and rail distortion are usually much less severe on the high than on the low rail, for which reason it can remain in service longer without reducing the riding quality of the track.

Rails are seldom transposed on curves of low degree, the usual practice being to allow the rails on such curves to remain in service until all of the rail, on both curve and tangent, in that particular stretch of track needs renewal. The heavier sections that are now being used commonly may alter this practice by reason of their expected longer life on tangents. If the heavier rail meets present expectations transposition may become necessary on some curves to tide the rail over the period until all of the rail in the stretch of track must be replaced. In any case where transposition is being given consideration, the decision must be based on judgment and experience since there are few data upon which to base an economic study. It is my impression that most supervisors desire to avoid transposing rail on curves if it is possible to do so.

Painting Stucco Surfaces

Can the exterior of a stucco building be painted? If so, how? Is this advisable? Why? What precautions must be observed?

Can Use Spray Gun

By E. C. Neville
Bridge and Building Master, Canadian National, Toronto, Ont.

Ordinarily there is little difficulty in painting the exterior of a stucco building, although the roughness of the surface makes it harder to clean in preparation for the painting and a little harder to apply the paint by the brush method, than smooth surfaces. If spray painting is employed, no difficulty should be encountered with respect to applying the paint. A man skilled in the use of spraying equipment will be able to manipulate the spray gun at the angle necessary to coat the rough surface evenly without undue waste of the paint and without leaving the surface with a blotched appearance. If spraying equipment is not available, however, and brushing must be resorted to, there is no reason why a good job cannot be obtained if the proper type of brush is used and reasonable care is exercised to spread the paint evenly.

The advisability of painting a stucco surface will depend entirely on what is required. If it is intended to make the building more attractive or to carry out the color scheme of adjacent buildings in a group of which it is part, the plan is feasible as well as advisable, but as a protective feature to prolong the life of the stucco it will have little value, for when stucco begins to disintegrate, the addition of a coat of paint will not help; it will be better to replace the stucco.

Cement stucco can be improved in appearance by the application of a cement wash, which will last for a considerable time. It can be applied cheaply with an ordinary white-wash brush, after the surface has been saturated with water, so that it will not rob the wash of its moisture.

A stucco building always looks attractive with a pure white finish which can be obtained through the use of white water paint, but for the most substantial job one should use a good white lead in a vehicle that consists of two-thirds boiled linseed oil and one-third spar varnish. In applying oil paint, the surface should first be cleaned by water from a hose and the liberal use of a stiff brush. It should then be allowed to dry thoroughly to insure adhesion of the paint. The first coat, like any priming coat, should be relatively thin, and sufficient time should be allowed between coats to insure proper drying before the succeeding coat is applied.

Is Recommended

By General Inspector of Buildings

Painting stucco as a means of saving it after deterioration has set in is a waste of both labor and material, as it will be a complete failure. On the other hand, the appearance of the stucco surface deteriorates after several years of exposure to the weather and this can be offset only by some form of surface treatment, of which painting is generally the most desirable. Dust gathers on the rough surface and runs down as mud when it rains, streaking and spotting the surface, while the dull lifeless color of weathered stucco is monotonous and tiresome, and needs to be livened.

Small cracks resulting from shrinkage and the action of frost are seldom serious if cared for in time, and can usually be bridged over by the paint film or filled with paint. The larger cracks that have been caused by settlement usually require pointing. Stucco is porous and will absorb a surprising amount of water, so that painting can be done successfully only in dry clear weather, the fall being the best season because the long periods of dry weather allow the stucco to become dried out thoroughly, not on the surface only.

Paint forms a tough moisture-resistant film which will exclude moisture and not only protect the stucco itself from deterioration, but the interior of the building will be subject to less dampness. Stucco should not be painted when new, but after several years of weathering should not "burn" the paint. However, if there is any uncertainty about the matter, the surface should be aged artificially by washing it with a solution made by dissolving two pounds of zinc sulphate in a gallon of water to neutralize the lime, and then be allowed to dry out thoroughly. This should also be done on all patches and pointed areas, making two liberal applications.

Any color desired may be used. An attractive method is to brush a final coat lightly over the high spots to give a two-tone effect, allowing the ground color to show from the depressions. This top coat should be fairly heavy and brushed lightly, not allowing the paint to work down

into the low spots. The trim should then be the same color as the darker coat.

The priming coat should be thin to satisfy the absorbent surface, using boiled linseed oil. The second and third coats should be the same as for wood surfaces, except that only half as much turpentine is required. Always apply three coats, making the final coat for the two-tone effect, if this is desired an additional application. While a flat finish looks best, it is not as durable as a glossy paint, and as it dries more quickly it requires more care in applying it.

Frequently Desirable

By A. T. Hawk
Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

From the standpoint of appearance and for the preservation of the structure, it is frequently desirable to paint stucco buildings. In painting a stucco surface, one must be sure to use continuous water-resisting materials, and must also make sure that the work is done at a time when these materials will not dry out too rapidly. Stucco should not be painted in extremely hot dry weather, as there is danger that the moisture will dry out of the coating material before it has had an opportunity to set permanently, thus causing it to fail.

In selecting stucco as a construction material, one should exercise care in selecting the proper materials for the application of the stucco finish. Ordinarily, metal lath exhibits a tendency to rust out quickly and, if used, should be of an approved rust-resisting material. My experience indicates that good white-pine lath is superior to metal for exterior stucco work. In any event, stucco should not come too close to the ground, where it may absorb moisture by capillary attraction. Adjacent shrubbery or bushes should not be allowed close to it, for the moisture from these bushes often hastens deterioration, especially if ordinary metal lath has been used as a support for the stucco.

In painting stucco, I have always insisted that the proper materials should consist of one coat of cement having the same characteristics as those of the stucco to which it is to be applied. It is true that in many instances stucco is coated with lead-and-oil paint, and that this does not make a bad-looking job when good materials are used and the work is done properly. My reason for using the cement coating in preference to the oil paint, is that one can maintain the original appearance with the cement, while the lead-and-oil paint makes a marked change in the appearance, often leaving the surface with few of the characteristics that are usually associated with the appearance of stucco.

Causes of Pounding in Pumps

What are the causes of pounding in a pump? How can it be prevented?

Three Conditions Usually

By R. C. Bardwell
Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

There are three conditions usually, any one alone or in combination with one or both of the others, that will cause pounding in reciprocating pumps. Perhaps the most common is a restricted section which may be caused by too high a lift or too small a pipe, either of which does not permit sufficient water to enter the cylinders and fill them at each stroke. When these conditions prevail, the pounding of the pump can sometimes be eased by installing a vacuum chamber on the suction line near the pump, but it is always better to correct the unfavorable suction conditions.

Air leaks in the suction line or in the rod packing at the water end of the pump will sometimes cause pounding. This condition can be corrected by proper maintenance. Sticking or other defects in the water valves will also cause pounding. This condition can also be corrected by proper maintenance.

Fall in Two Groups

By C. R. Knowles
Superintendent Water Service, Illinois Central, Chicago

The causes of pounding in pumps fall in two groups, namely, those that result from improper installation, and from mechanical defects in operation and maintenance. One of the principal causes of pounding is insufficient flow through the suction line, which prevents the filling of the cylinders at each stroke. This may result from too great a suction lift or a suction line too small in diameter. The pump should be located as near the source of supply as conditions will permit. The vertical distance from the water level to the pump suction (the suction head) should be well under the suction limit, which is 34 ft. at sea level.

A suction line should always be of sufficient size to permit delivery of the required amount of water to the pump without undue friction losses. It is good practice to have the suction pipe at least one size larger than is called for by the maximum delivery of the pump. Even larger pipes are necessary where there are many bends or if the suction line is very long. Air chambers are also desirable on long suction lines to take care of shocks resulting from surge of the water. Air chambers are equally desirable on discharge lines from pumps. Where they are kept filled with air they act as cushions to absorb shocks and prevent or reduce water hammer. They are essential to the proper operation of high-speed pumps.

In the second group, which includes the details of operation and maintenance that affect the pounding of pumps, obviously the most important is the suction and discharge valves. Missing or badly worn valves and broken valve springs may cause a pump to pound badly and will decrease its efficiency materially. Improper setting of steam valves is also a contributing factor to pounding because of the uneven stroking of the pump. In extreme cases improperly set steam valves may result in pounding because the piston strikes the cylinder head.

Many reciprocating pumps are equipped with cushion valves for adjusting the stroke of the pump. Proper adjustment of these valves is an important factor in preventing hammer or pound in pumps. The method of packing a pump will also sometimes have an effect on the tendency of the pump to pound or hammer. For example, if the piston on one side of a duplex pump is packed tighter than on the other side, the increased friction on the tightly packed side may slow up the movement of the piston on that side, resulting in uneven or short stroking.

Again, pounding is sometimes

caused by allowing the pump to become air-bound. This can usually be overcome by exercising care to insure that the pump is properly primed when it is started. Air present in the cylinders of a pump when in operation is alternately compressed and expanded, thus preventing the admission of water to the cylinder. A condition such as this will invariably result in uneven stroking and, therefore, in pounding.

Preframing Bridge Timbers

What information is necessary to permit the preframing of ties, guard timbers, stringers and caps for use in replacement? How is this information to be obtained and how presented to the framing gang?

Accurate Driving Required

By F. H. Cramer
Assistant Bridge Engineer, Chicago, Burlington & Quincy, Chicago

When timber treatment first came into vogue all holes were bored and all framing was done in the field. Experience soon showed that the interior of the timber was then exposed to decay and that much of the value of the treatment was lost, owing to the limited penetration of the preservative. This depended somewhat on the density of the wood. This experience brought about a revision of both trestle plans and field practices, until today preboring and preframing are accepted as necessary where treated timber is used.

To prebore and preframe bridge timbers satisfactorily the bents must be driven accurately and in accordance with the plans for the structure. To prebore caps the center line of the cap can be drawn across the tops of the piles after they have been driven and spaced to final position, so that the spacing of the drift bolts or other fastenings can be obtained and the dimensions recorded on the erection diagram.

Another method is to prebore the holes in accordance with the standard plan and pull the piles to position. If the driving is hard, however, this may not be practicable and it will be necessary to bore new holes in the field, although even under bad driving conditions most of the holes can be used. It is better to get the exact spacing of the bents and piles, measuring the former accurately at both ends of the caps.

If butt stringers are used they can be assembled in the yard, and the holes bored to match. If the stringers are to be lapped they should also be assembled, in which case the holes will fit accurately regardless of how the stringers are skewed. The boring of the ties is a simpler matter, including the spike holes for both running and guard rails. Guard rails can always be prebored in accordance with the standard plan.

Follow Standard Plan

By C. A. Whipple
District Engineer, Chesapeake & Ohio, Columbus, Ohio

As a preliminary to determining the information necessary for preframing timbers, reference is first made to the standard plans for the dimensions and relative position of the timbers in the structure. If the structure is to be renewed completely, it is only necessary to give the framing force a skeleton plan showing the type of structure, any deviations from the standard plan, the stringer layout, the distance between bents, and the spacing of the piles in each bent. This information, together with the standard plans, should enable the framing force to lay out the caps and stringers, bore the necessary holes and do what framing is necessary. If frame bents are to be used the heights of the several bents must also be given. In either case, the individual timbers are then marked in accordance with the designation on the standard drawing to facilitate erection. For ties, the information includes the weight and section of the running rail and of the inside guard rail.

For ties on steel bridges, the information necessary includes the size of the timbers, the thickness of the tie over the stringers, the width of the stringer flanges, the spacing of the floor beams, the distance from the center of the track to the center of the stringers and the weight and section of the running and inside guard rails. If on a curve, the thickness of the tie over each stringer is necessary to assure correct framing.

Why Eliminate Weeds?

What considerations justify the elimination of weeds? What is the importance of each?

Keeps Ballast Clean

By C. S. Kirkpatrick
Chief Engineer, Missouri Pacific Lines, Houston, Tex.

The elimination of weeds is justified (a) to improve drainage and preserve the effectiveness of the ballast shoulder for further use as a surfacing material; (b) to reduce the amount of hand labor required for spotting, surfacing and lining track; (c) to reduce fuel consumption and delays to trains, which occur where weeds and grass reach a size that permits them to lap over the rail; and (d) to provide a cleaner and neater appearing track and a better job of housekeeping, to the end that the morale of the track forces may be kept up. While there are other reasons, these are the principal considerations, listed in the order of importance.

It is my experience that where ballast of any kind is permitted to become fouled with weeds and roots over a long period, its effectiveness from a drainage standpoint is greatly impaired, as is its fitness for track surfacing. This makes it necessary to haul in repair ballast, which increases the cost of maintenance. It is not my contention that the ballast shoulder must be kept absolutely clear of weeds the year round, but reasonable care is all that is required to accomplish the desired results. It is necessary that sidings and branch lines be kept sufficiently clean to avoid engines slipping and causing undue delays.

Where weeds and grass are allowed to grow on the ballast shoulder, the first thing the track forces must do when working the track is to clear away the weeds. This requires considerable time, especially in our section of the country. I have estimated that as much as 15 per cent of our labor would be spent in this

task, if we did not use weed destroying devices, such as discers and weed burners.

I do not advocate spending money for cleanliness only, considering the conditions that now confront us, but it is my experience that a certain amount of cleanliness is necessary, and can be obtained regardless of the size of the track forces. It is discouraging to a trackman to be hampered with grass and weeds when he is trying to keep up his track. It is also my experience that we are never too poor to be orderly and to practice cleanliness to the extent possible.

I am not in agreement, and never have been, with the theory that we must not cut the right of way or do any cleaning because we are too poor. The managing officer who issues such instructions loses a lot in cleanliness and orderliness on the property, that he might otherwise have had without any increase in expense. One gets only what he asks for, and sometimes not even that. For these reasons, I contend that it makes no difference how poor we are, or how limited the force, we should maintain at least a semblance of orderliness and cleanliness.

Gives Four Reasons

By George M. O'Rourke
District Engineer, Illinois Central, Chicago

I list the principal considerations which justify the elimination of weeds in the following order of importance:

1. Drainage. Removing weeds from the ballast section improves drainage and prolongs the life of the ballast and ties; retards churning, thereby extending the life of the ties, joints and rail ends; and reduces the amount of labor required to maintain line and surface to any reasonable standard.

2. Fire Prevention. The elimination of weeds and grass on the right of way and under bridges, prevents fires and the possible destruction of structures.

3. Morale. Keeping the property free of weeds tends to maintain a higher morale among trackmen. More work can be accomplished when it is not necessary to cut a swath along the shoulder or to clean weeds from the ballast before the track can be opened for the purpose of doing work.

4. Legal requirements. Many states have laws relating to noxious weeds. In some states the number of weeds classified as noxious is so great that it is necessary to cut all weeds on the right of way to insure that the law is being complied with.

Track Rides Better

By L. A. Rape
Section Foreman, Baltimore & Ohio, Claysville, Pa.

Drainage, appearance and liability afford ample justification for the elimination of weeds, although other factors are present. Drainage is of first importance, for weeds tend to foul the ballast, retard the flow of water in surface ditches, and clog the gratings of inlets to subsurface drains. Second in importance is liability, for when weeds become dry the fire hazard is great and if a right of way fire extends to adjacent property, railway liability may run into large figures. Besides, there is always the danger of fire in the railway's own structures.

I would put appearance next in importance, especially on those roads that have important passenger traffic, for a dirty, ragged and weedy right of way creates an adverse reaction in the minds of passengers. In fact, it has often been noted that even railway men are prone to believe that the riding qualities of the track are impaired where weeds are not taken care of, while the same track will ride satisfactorily after the weeds are cleaned from the roadbed and the right of way has been mowed. It pays, therefore, to keep the weeds down, for no railway can afford today to lose favor with the traveling public unnecessarily.

Anti-Creepers in Yards

To what extent is the application of anti-creepers warranted on yard tracks? Why?

Have Economic Value

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

In a manufacturing plant the raw or partly finished materials are started at one end and progress continuously until they emerge at the other end of the line as finished products. The principle of continuous forward movement is the basis of modern yard operation, particularly where switching is done over a hump, for, in general, cars move continuously from the receiving end of the yard to the departure end. For this reason, in many yards most of the movements made over the yard tracks and switching leads are in one direction, and the rail on these tracks tends to creep in the direction of these movements.

If anti-creepers are not applied, the same thing happens as on main tracks, that is, the rail runs tight and the ties slue and bunch. When this happens the rails must be cut or driven back and the ties straightened. This is an unnecessary and wasteful expense, since it can be eliminated by the application of anti-creepers at only a fraction of the cost that is required to recondition the track.

Again, if we do not apply anti-creepers on ladder tracks and for a reasonable distance back of the frogs, we cannot expect to hold the frogs in place or to keep good line and gage through them. The same is true of the switch points, which are likely to bind against the head blocks or adjacent ties, making it difficult to throw the switches or keep them in adjustment. When switching is under way, a quick, easy-throwing switch is important.

I am convinced that, while the same hazard is not involved in yards as on main tracks, it is otherwise as important to apply anti-creepers in yards as in main tracks wherever the rail shows a tendency to creep. The same economic principles are involved in one case as in the other. It is seldom necessary to buy new materials to do this, except for tracks that are laid with obsolete patterns of rail, since anti-creepers that have been released from main-track service are usually available.

On Some, Not on Others

By L. A. Rape
Section Foreman, Baltimore & Ohio, Claysville, Pa.

Anti-creepers can be fully justified for some yard tracks, but not for others. Where the yard or switching movements are all in one direction or where cars are "kicked" into tracks with the brakes partly set, the rail almost invariably creeps in the direction of the car movement.

An adequate number of anti-creepers will overcome this creepage. Where tracks are used about as much in one direction as in the other, anti-creepers can seldom be justified, for the tendency to creep is about balanced as to direction.

Ladder tracks and hump tracks invariably need anti-creepers. There is usually enough trouble on ladders without the complication of creeping rail, and a close inspection should be made periodically to determine whether anti-creepers should be applied to prevent the frogs from being pulled or pushed out of line, on those tracks not now provided with this protection.

Does Not Favor

By M. D. Carothers

Division Engineer, Alton, Bloomington, Ill.

I do not believe that anti-creepers are warranted on most yard tracks. There may be certain pull-in or departure tracks on which the rail tends to creep, but this is usually of minor consequence and seldom reaches the point where anti-creepers can be justified. There are very few yard tracks of such length, say one mile, that rail creepage will accumulate to the extent of causing trouble, as it does on high-speed main tracks, where anti-creepers have become a necessity.

Favors Their Use

By Engineer Maintenance of Way

I am very much in favor of using anti-creepers wherever rail tends to creep, whether this be on main or yard tracks. In any yard there are tracks that never give trouble from rail creepage and these can be dismissed from consideration, for there would be no point in applying anti-creepers to such tracks. On the other hand, every one who is experienced in the maintenance of large yards, and some of the smaller ones as well, knows that rail creepage is persistent on certain tracks unless action is taken to prevent it. In my experience nothing has been devised that is equal to the anti-creeper for this purpose.

Entrance and departure tracks, hump tracks, ladders and even body tracks where car and train movements are primarily in one direction are likely to give this trouble. Tie conditons are not always at their best and spiking is rarely given the same attention as on main tracks, while in many cases drainage is not as effective as it should be. These subnormal conditions all tend to accentuate rail creepage, which can best be overcome by anchoring the rail.

Observation of almost any ladder track that does not have anti-creepers will disclose frogs out of line and switch rods that are binding on or are too close to the headlocks, with undue wear on all parts of the turnouts. These conditions can be greatly improved by applying an adequate number of anti-creepers through the turnout itself and by extending the application far enough beyond the frogs to insure that creepage of the rail on the yard tracks is eliminated.

Power Tools in Building

For what purposes can power equipment and tools be used to advantage in the construction and maintenance of buildings?

Have Many Uses

By Supervisor of Buildings

In this day and age, and particularly under conditions as they exist at present, no one can afford to perform an operation manually if there is a power tool available for doing the work. Power hand saws constitute a type that can perhaps be used more frequently than almost any other tool, for much sawing must be done in framing timbers and lumber for the construction of new buildings and in fitting when making repairs.

On a large job where electric power is available or can be generated on the ground, portable motor-driven circular saws and portable band saws are quite valuable as time savers and in many cases will more than pay for themselves during the progress of a single job. The former can be used to advantage for ripping lumber and for cross-cutting the larger pieces. If a cutting head with attachments is provided, this tool can be used as a planer, for cutting rounded edges, to tongue and groove and for various other purposes.

A band saw is particularly valuable for the lighter work of ripping, and if provided with a tilting table for bevel sawing its usefulness will be greatly enhanced. A tool of this type enables one to saw to a curved line, which is often a real problem where only hand tools are available.

There are many other power tools that can be used to advantage on almost any job that is of sufficient magnitude to warrant the transportation of the necessary power units, and that demonstrates real value in expediting the work and furthering economy. These include chain hoists, power drills, wood-boring tools, portable pumps, concrete mixers, nut runners, paint-spraying equipment and hoisting equipment. Even larger and heavier units such as sand blasts, cranes, clamshell buckets, jack hammers, clay diggers and sanding machines are time savers for special classes of work that must be done by the building forces.

Power Tools Invaluable

By General Inspector of Buildings

Present conditions demand the fullest practicable use of power machines in all classes of railway maintenance, including buildings, for, owing to restricted appropriations, many repairs that are badly needed could not be made if we were compelled to rely solely on manual methods. Obviously, we are doing many small jobs where the cost of shipping and setting up the power units is prohibitive. In other cases, such as the application of hardware, the replacement of window glass, etc., power tools would be of no help.

There are many other jobs, however, where power equipment not only expedites the work but enables it to be done more economically. Power saws, drills and wood-boring tools probably stand at the head of the list of those that are useful on almost all kinds of work that requires considerable quantities of lumber. These saws should be provided in several sizes, since a 6-in. saw is too unwieldy for use with 1-in. or smaller material, while the 3-in. tools require too much manipulation in sawing, say, 6-in. sticks.

Chain hoists, while not strictly power tools in the generally accepted use of that term, are very useful where heavy timbers or other heavy materials must be lifted. With such a hoist a load that would strain several men can be lifted with ease and held steady while it is being shifted into place. Other tools that are particularly useful for building work include nut runners, paving break-

ers, jack hammers, clay diggers, stone drills, small concrete mixers, centrifugal pumps, bolt drills, chipping hammers, rotary wire brushes, paint sprays, augers up to 1-3/16 to 1¼ in., close quarter drills, etc., depending on the various kinds of work demanded of the building forces.

Recent developments in power units should stimulate the use of tools such as those mentioned, for light-weight electric generators which can be handled easily by one or two men are now available for operating them. Until recently most of these tools have been air-operated, requiring an air compressor. While air compressors are valuable equipment for many kinds of work they are too heavy to have the flexibility that is necessary to make the use of these light portable tools a complete success in building work.

Avoiding Injuries to Trackmen

What precautions should be observed when renewing ties to prevent injury to trackmen?

All Work Hazardous

By L. D. Gardner
Roadmaster, St. Louis-San Francisco, Poplar Bluff, Mo.

All work in connection with the renewal of ties is subject to certain hazards. We have more personal injuries while renewing ties than in any other class of track work. Ties should be loaded in box or stock cars, and tie tongs should be used when unloading them. Trackmen should always be cautioned not to rub their faces with their gloves after handling creosoted ties, as they may get creosote in their eyes. Tie tongs should be used to pull ties in the track for picks and shovels not only damage the ties but slip easily and thus cause injuries. When this occurs the trackman almost invariably falls across the rail and hurts himself.

When a tie is being nipped, the spiker should avoid striking it on the end to line it, as this is very dangerous because creosote may fly out and get in the nipper's eyes. We have had several eyes lost in this way. Again, creosote is likely to get on the striking face of the maul and cause the spiker to "shoot" the spike and strike the nipper, himself or his partner.

Tools Must Be Safe

By J. J. Desmond
Division Engineer, Illinois Central, Chicago

When renewing ties the men should be spaced far enough apart to avoid striking each other with picks or other tools while cribbing preparatory to placing the ties, and with spike mauls while spiking. It is a serious mistake to allow the ties to be pulled into place with shovels or picks, as this increases the accident hazard, besides causing damage to the ties. Tie tongs should always be used for this purpose, as well as for pulling the old ties out. While it is the duty of the employees to exercise care to avoid injury to themselves and their companions, eternal vigilance on the part of the foreman is necessary to safeguard the men.

Extreme care should be exercised to insure that safe tools are provided and used in a safe manner. Cross spiking should not be permitted under any circumstances for it is a hazardous practice that has caused many serious injuries. When working on multiple tracks, special caution should be exercised to prevent fouling adjoining tracks, since extra and special trains may be run at any time without previous notice.

Let Experienced Men Lead

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Tie renewals are most prolific of accidents. To reduce them the men should be paired, with the more experienced man as leader. In cribbing, the leader should handle the pick, with the junior man using the shovel or fork. Likewise the more experienced man should handle the claw bar to do the pulling of the spikes. When removing the old tie, the leader should know that the picks or other tools, excluding shovels, are well set and not likely to pull out. When ready to insert the new tie, the leader should allow the less experienced man to lift his end first, and should always take the end that is to be slipped under the rail so that the younger man will have the advantage of standing on the level shoulder of the roadbed.

When the tie is in place, the leader should be certain that his companion has placed his bar in such a way that when he lifts the tie the bar will not slip and hurt him or some other trackman. When tamping, he should also be responsible for knowing that the picks are being handled in such a way as not to cause injuries. When spiking, the leader should handle the gage, and know that the handles are tight in the mauls so that this defect will not cause injuries.

I have mentioned these items particularly because tie renewals are most prolific of personal injuries, and the things I have mentioned are the most frequent causes of these injuries. A careful foreman will follow substantially the plan I have outlined, and will find that both safety and economy of time will be served by doing so.

Danger in Unloading

By W. Woolsey
Section Foreman, Illinois Central, Chicago

Most injuries in connection with tie renewals occur while unloading them. They are usually loaded in open top cars and distributed by work train or local freight. If they are being handled in this way the men should be instructed to pick up and let go of the ties in unison. When picking up those from the bottom of the car it is necessary to raise them to a considerable height to get them over the side. At this point enough men should be assigned so that this can be done without straining; otherwise the tie is likely to strike the edge of the side and pinch fingers or hands.

When placing the ties in the track, the foreman should see that the tongs are kept properly sharpened, as many injuries result from using tongs that are not sharp enough to maintain their grip on the tie. This is a simple matter that should never be overlooked.

Trackmen should be instructed that when they are handling treated ties they should not allow hands or gloves to come in contact with their faces. It is preferable that they wear rubber gloves, which are on the market, made for this purpose, as this will protect them from contact with creosote. These gloves are as cheap as other gloves and they can be kept at the tool house specifically for use when handling ties, as they are not altogether suitable for general use.

What Our Readers Think

Motor Cars and Power Plants

Alliance, Ohio.

To the Editor:

I have read with interest the editorial entitled Motor Cars—Should They Be Power Plants, which appeared on page 245 of the April issue. While I quite agree with what was said about incorporating power plants in motor cars that are designed primarily for hauling requirements, I believe that there is a real opportunity to take advantage of the existing power plants to run auxiliary tools.

I have in mind particularly such tools as portable grinding wheels that could be operated by means of a flexible shaft connected with a take-off from the present motor. It is customary to provide hand-grinding wheels for each section or gang to take care of tool repairs. A flexible-shaft grinding wheel with a clamp holder would fill this requirement, and the cost of the two pieces of equipment will not differ greatly.

As an added advantage, the portable grinder could be used to smooth the joints of a single rail, or the beginning and end of a string of several rails when emergency renewals become necessary. By changing wheels the grinder could also be used to advantage to slot badly worn rail ends, to forestall chipping; and to face the ends of rails when renewing insulation. In the maintenance of switches the bead or lip on the stock rails could be ground to provide a better fit when new points are installed and thus prevent the probability of chipping or breaking the new points.

In this way, with little or no additional expense, track gangs could supplement the regular grinding gangs and do work that requires grinding at a time when it is most needed, and when the regular outfit may not be available. This arrangement would not affect the use of the larger power grinders, which are generally assigned to more important and larger projects, but it would be helpful because it would tend to maintain in better shape and for a longer time the improvements they have effected.

Gerald E. Chambers.
Assistant Supervisor,
New York Central.

[Manufacturers are in position to supply motor cars with engines developing from 5 to 85 hp., but every increase in the capacity of the engine increases the weight of the car, and the larger engines add appreciably to this weight. The lighter engines are not equipped with governors and, in general, the transmissions are not designed for continuous use, for which reason they are not adapted for the development of power even for small tools. As was stated in the editorial, engines of the truck and tractor type might be fitted with power take-offs and special drives, but even in this case the engines are designed primarily for transportation and, therefore, do not lend themselves to the economical development of power for other purposes.—Editor]

A Foreman Discusses Safety

Rush Tower, Mo.

To the Editor:

Safety affects every railway employee. It should be uppermost in the minds of foremen and men alike at all times. Safety is primarily the responsibility of the foreman however, for he is the only man in the gang with the authority to stop unsafe practices, if they exist. A foreman who has the welfare of his men at heart does not allow unsafe methods to develop into practices. He so directs the activities of the individual members of the gang and so arouses their interest in safe methods that they develop a feeling of responsibility on their part and become alert to avoid practices that might endanger themselves or their co-workers.

I have been a section foreman on the Frisco for 24 years, and during this time I have had only one reportable accident. I am proud of this record. I am also very much gratified to be able to say that every one of the men who has worked in the gang is equally proud.

I am convinced from this experience that the best way to make a record for safety is to educate the men themselves to be careful, and this is the basis of the plan I have followed consistently. I not only try to be careful myself in assigning the work, but I talk to the men with the purpose of showing them how they can be careful in its execution.

One of the fundamental rules that I have tried to follow is to give my instructions quietly, for there is nothing that will get a gang excited and confused more quickly than orders given in a loud and excited manner. Getting a gang of men excited causes more accidents than any other one thing that I know of, except downright carelessness. This is particularly true when handling rails or other heavy objects and when handling motor cars to and from the track.

In the operation of a motor car, every member of the crew should be alert to watch for obstructions that might derail it. They should feel a personal responsibility for seeing that tools are so loaded that they will not fall off or interfere with the men when getting off.

Another rule that I have followed is to speak to my men on some phase of safety every day. While it may not be necessary to do this so often where the members of the gang are all experienced, I find that it is a good thing, for it keeps these matters fresh in their minds. On the other hand, new men should be instructed intensively until they realize the importance of safe practices and it is observed that they are watching out for themselves. In these talks I try to speak kindly and intimately with a view to getting the men to understand that I am not trying to lay down arbitrary rules, but that what I am saying is for their own protection against injury.

One matter stands out more prominently than others, and the rules covering this are enforced rigidly. I refer to the rules for flagging. The protection thus afforded extends beyond the safety of the members of the gang itself, since it affects the safety of trains and, it may be, the lives of passengers. Every place where the track is obstructed or is not in condition for full speed, should be protected by flags. While always important, it is more important today than formerly that flagging be supervised intensively, since the weight and speed of trains have increased greatly in recent years, and braking distances have increased correspondingly. Flags should, therefore, be sent out a sufficient distance to permit the stopping of the fastest trains.

Safety records of recent years on American roads have been commendable, but injuries to employees still occur too frequently. If every person in a supervisory capacity would live up to the safety rules and require his men to do so at all times, even this good record could be bettered.

Henry Becker,
Section Foreman,
St. Louis-San Francisco.

NEWS of the Month

Safe Foremen

In 1924, the Union Pacific established a practice of awarding a merit card to each foreman who, through careful supervision, did not sustain a lost time or a reportable injury to himself or the employees under his supervision. A total of 2,028 merit service award cards were distributed that year. In the last or 14th year of this practice, 339 foremen were still maintaining clear records, of whom 268 foremen are in the maintenance of way department. Many of the remaining foremen had perfect records until they were removed from service through retirement or death.

Large Wheat Crop Promises Heavy Loadings

The railroads of the middle west are preparing to handle one of the largest crops of winter wheat in history. Recent estimates indicate that this year's crop will probably exceed that of 1931, which was 825,000,000 bushels. In anticipation of this large crop, the railways started accumulating cars in the wheat-growing sections of the Southwest late in April, and expect to have available from 40,000 to 50,000 cars suitable for grain loading by the time harvesting begins.

Southern Pacific Claims a Record

"The Daylight," the new high-speed streamlined trains (one in each direction) which the Southern Pacific placed in operation between San Francisco, Cal., and Los Angeles on March 21, 1937, are claimed to be the most heavily patronized, one-section, long-distance daily trains in operation. During their first year, these trains carried a total of 253,573 passengers, an average of 695 each day, while in the twelve months ending April 30, they carried 277,769 persons, of which 139,864 were handled northbound and 137,905 were handled southbound.

Board Control Shifts on Illinois Central

Illinois Central stockholders voted at the annual meeting in Chicago on May 18 to select a majority of the members of the board of directors from the territory served by the railroad. Also, the directors will meet hereafter in Chicago, rather than in New York, a step instituted largely at the suggestion of William A. Harriman, chairman of the Executive Committee, who contended that concentration of railway control in New York was undesirable.

Colorado & Southern Abandonment

Under the terms of a court settlement of a suit brought by Victor Miller, a Denver, Col., attorney, the Colorado & Southern may resume the dismantling of its narrow-gage line between Denver and Leadville, Col., authority for the abandonment of which has already been secured. The dismantling of this line was started last fall, but was stopped by Miller's suit. Under the terms of the settlement, Miller will receive a certain amount of the line's equipment which, he said, would be used on the Rio Grande Southern in Southern Colorado.

Ask I. C. C. to Reconsider Eastern Coach Fare Decision

A petition, with supporting brief, has been filed with the Interstate Commerce Commission by the Eastern railroads, asking for re-argument and reconsideration by the Commission of its recent 6-to-5 decision denying the application of eastern carriers for authority to increase basic coach fares from 2 cents per mile to 2.5 cents. The brief, a 53-page document, emphasizes the importance of passenger revenue to Eastern carriers, and contends that the present rates have not improved revenue results, and that "the proposed basis will improve net revenues."

Capital Expenditures for Roadway

The railways made capital expenditures for roadway and structures in 1937 totaling $186,916,000, as compared with the expenditure of $139,887,000 for similar purposes in 1936. Of these expenditures in 1937, $29,149,000 went for heavier rail, compared with $31,789,000 in the preceding year; $19,550,000 was expended for bridges, trestles and culverts, or approximately $1,000,000 more than in 1936; and $14,593,000 for yards and sidings, an increase of $3,600,000 above expenditures for this purpose in 1936.

Other expenditures were also made for additional ballast, shops and engine houses, station and office buildings, signals and other improvements. By way of comparison, capital expenditures totaling $322,877,000 were made in 1937 for locomotives, freight and passenger train cars and other equipment, as compared with $159,104,000 for such purposes in 1936. These latter figures reflect the large orders placed late in 1936 and early in 1937 for cars and locomotives to be delivered last year. All the above figures are exclusive of expenditures for maintenance charged to operating accounts.

Union Pacific Orders New Lightweight Box Cars

Fifty new lightweight box cars, each weighing only 36,900 lb., or 8,300 lb. less than the weight of the 1937 standard A.A.R. box car, have been ordered by the Union Pacific from the Bethlehem Steel Company. The principal features of these cars are a completely welded underframe, and the use of high-tensile corrosion-resistant low-alloy steel, which is used throughout the entire car, except in the center sill, which is made of open-hearth carbon steel. Based on a capacity of 3,735 cu. ft., these cars will have a light weight of 9.88 lb. per cu. ft., and the ratio of maximum load to tare weight will be 78.2 per cent.

New Santa Fe Bus Service

Following a decision of the California Railroad Commission, the Atchison, Topeka & Santa Fe is preparing to inaugurate coordinated bus and train service between Los Angeles, Cal., and San Francisco on June 17, on a schedule of 9½ hr. for the 409 miles via this route, or 15 min. shorter than the fastest present schedule between these cities. Two streamlined air-conditioned trains will operate daily between Oakland, Cal., and Bakersfield, with connecting air-conditioned buses between Bakersfield and Los Angeles. This new service will be offered at a rate of 1½ cents per mile, as compared with the 2-cent all-rail coach rate prevailing generally in California.

Abandonment of 249-Mile Line Asked

On May 19, the Quincy, Omaha & Kansas City, a 249-mile line extending between Quincy, Ill., and Kansas City, Mo., petitioned the Interstate Commerce Commission for permission to abandon its entire line. This line, which is owned by the Chicago, Burlington & Quincy, extends through a sparsely populated region of northern Missouri and serves 46 towns, only 9 of which have a population in excess of 1,000. Of these nine towns, eight are served adequately by other railroads.

This road depended largely upon local agricultural products and livestock for its traffic. Its petition pointed out that as a result of the reduction in crop acreage and in livestock, and increased competition of motor trucks in the territory served, it had failed to earn annual operating expenses during any of the last 17 years, in spite of the fact that these expenses were reduced from $1,408,347 in 1921 to $421,326 in 1927. Within this period the aggregate deficit in net income amounted to $2,193,054.

Notice Served by Carriers of 15 Per Cent Wage Reduction

Formal notice was given by the Association of American Railroads to the chairmen of the railroad employees' brotherhoods on May 12 that the principal railroads of the United States will reduce basic wage rates 15 per cent effective July 1. On the same day the Carriers Joint Conference Committee issued a statement explaining the position of the railroads in which it pointed out that the action was compelled by the crisis now confronting the railroad industry, which is even more serious than that which confronted them in 1932.

The representatives of railroad labor have asserted that they will resist the reduction. If they hold to this, the dispute will go first to a conference. If this conference fails, either side may invoke the services of the Board of Mediation, or the Board of Mediation may offer its services. The function of this body is to bring about an amicable settlement of the dispute, or to induce the parties to arbitrate. Neither party can be compelled to submit the case to arbitration. As a matter of fact, the labor unions have frequently declined to do so under similar situations. If arbitration is refused, and, in the judgment of the Board of Mediation a serious interruption of interstate commerce is threatened, it is the duty of that body to notify the President, who may then create a board to investigate and to report to him within 30 days. The recommendations of the President's board, however, are not binding upon either of the parties.

C. & N. W. Wins Safety Award

The National Safety Council, at a meeting in Chicago on May 16, presented its safety award for the year 1937 to the Chicago & North Western, winner among the Class A railroads of the United States, a group which includes the 19 largest railroads in this country. The North Western had a casualty rate, killed and injured, of 3.82 per 1,000,000 man-hours. The Union Pacific was the winner in 1936 and also had a low rate for 1937 of 3.38, but because of a rule of the contest that no railroad may win the award for two successive years, the award was made this year to the North Western.

The Michigan Central won in the Class B group. The winners in the other groups were as follows: Class C, the Long Island railroad; Class D, the Gulf, Mobile & Northern; Class E, the Staten Island Rapid Transit; Class F, the New Jersey & New York; and in the Class G group, the Philadelphia zone of the Pullman Company.

Personal Mention

General

Joseph H. Nuelle, president of the Lehigh Coal & Navigation Company and of the Lehigh & New England, and an engineer by training, was elected president of the Delaware & Hudson at the annual stockholders' meeting on May 10, succeeding **Leonor F. Loree,** whose retirement was reported in the May issue. Mr. Nuelle was born in Chicago on April 9, 1881, and received his secondary education at Phillips Exeter Academy, Dartmouth College and Princeton University, from which latter institution he was graduated in 1906. He entered railroad service with the Pennsylvania in 1906 as a rodman. Late in 1907 he went with the New York, Ontario & Western as assistant engineer, was promoted to engineer maintenance of way in 1912, and became chief engineer of the road in 1913. In 1915 he became assistant general superintendent and was promoted to general superintendent in 1916. Between 1918 and 1920, during federal control, he served as federal manager of the road. Upon the return of the railroads to private operation, Mr. Nuelle became general manager. In 1923 he became vice-president and general manager, and in 1930 was elected president of the road. This post he resigned in April, 1937, to become president of the Lehigh Coal & Navigation Company and its subsidiary, the Lehigh & New England.

Joseph H. Nuelle

Engineering

E. T. Barrett, division engineer on the Denver & Rio Grande Western, with headquarters at Alamosa, Col., has been promoted to the newly-created position of engineer of track, with headquarters at Denver, Col., effective June 1.

W. O. Rutherford, division engineer of the Chicago Great Western, with headquarters at Des Moines, Iowa, has had his jurisdiction extended over the Illinois and the Iowa divisions, and will have his new headquarters at Oelwein, Iowa. **R. C. Arnold,** who has been acting division engineer at Oelwein, returns to his former position at St. Paul, Minn.

D. B. Jenks has been appointed division engineer of the Klamath division of the Great Northern, with headquarters at Klamath Falls, Ore., succeeding **C. B. Harding,** who has been assigned to other duties.

C. I. Van Arsdalen, supervisor on the Illinois Central, with headquarters at Effingham, Ill., has been promoted to division engineer of the St. Louis division, with headquarters at Carbondale, Ill., succeeding **C. J. Harrington,** who has been transferred to the Illinois division, with headquarters at Champaign, Ill. Mr. Harrington succeeds **W. E. Russell,** who has been assigned to other engineering duties on the Springfield division, with headquarters at Clinton, Ill.

A. B. Clark, assistant to the chief engineer of the Pennsylvania, with headquarters at Philadelphia, Pa., retired from active service on April 30, after nearly 50 years service with this company. Mr. Clark was born in 1867 at Green Village, Pa., and received his higher education at Lafayette University, graduating in 1891. During the summer vacations of 1889 and 1890, Mr. Clark worked for the Pennsylvania, and after graduation from college, he returned to this company as a rodman on the Philadelphia division. Subsequently, he served in various capacities in the engineering department on different divisions until 1909, when he was promoted to division engineer of the Maryland division. In the following year, he became principal assistant engineer of the Philadelphia, Baltimore & Washington (part of the Pennsylvania), being appointed assistant engineer maintenance of way in 1913. Three years later, he was transferred to the operating department as superintendent of the Renovo division, later being transferred to the Philadelphia Terminal division and thence to the Trenton division. He had served as assistant to the chief engineer, with headquarters at Philadelphia, since April 16, 1930.

Track

J. A. McKay, relieving roadmaster on the Canadian National, has been promoted to roadmaster of the Halifax division, with headquarters at Halifax, N. S., succeeding **C. O. Lohnes,** deceased.

Charles Swanson, section and extra gang foreman on the Revelstoke division of the Canadian Pacific, has been promoted to roadmaster at Proctor, B. C., succeeding **F. Parnaby,** who retired on May 1.

J. M. Collins, whose promotion to supervisor of track on the Grand Rapids division of the Pennsylvania, with headquarters at Petoskey, Mich., was reported in the April issue, was born at Clarington, Ohio, on June 11, 1900 and entered railway service as a clerk on the Pennsylvania on September 7, 1920. He was promoted to draftsman on January 16,

1923, and to assistant supervisor on March 1, 1928. He was appointed assistant foreman on April 16, 1935, and on November 11, 1935, he was promoted to foreman of a welding gang. On January 2, 1936, he was appointed general foreman of a rail laying gang, and on March 3, 1937, he was promoted to assistant supervisor of track at Warsaw, Ind., which position he held until his recent promotion.

L. L. Smith, track supervisor on the Chicago Burlington & Quincy at Burlington, Iowa, was promoted to roadmaster, with headquarters at Centerville, Iowa, succeeding **M. C. Van Welkinburgh,** who was transferred with the same headquarters, to succeed **S. J. Sharpe,** who retired on May 1.

W. Naas, section foreman on the Chicago & Illinois Western (part of the Illinois Central System), at Chicago, has been promoted to road supervisor on the Chicago Terminal division on the Illinois Central, succeeding **J. A. McLeod,** who died on May 9.

W. S. Williams, section foreman on the Illinois Central, has been promoted to supervisor, with headquarters at Mattoon, Ill., succeeding **L. H. Bond, Jr.,** who has been transferred to Effingham, Ill., replacing **C. I. Van Arsdalen,** whose promotion to division engineer is reported in these columns.

E. Whitman, section foreman and general foreman of extra gangs on the Chicago, Milwaukee, St. Paul & Pacific at Tunnel City, Wis., has been promoted to roadmaster at La Crosse, Wis., succeeding **J. T. Loftis,** who retired on May 16.

Frank Herlehy, extra gang foreman on the Chicago, Milwaukee, St. Paul & Pacific, has been promoted to roadmaster at Milwaukee, Wis., succeeding **C. F. Allen,** who was transferred to Spokane, Wash., on February 1, replacing **O. Bakke,** who retired on that date.

J. W. Buford, assistant supervisor of track on the Pennsylvania, with headquarters at Columbia, Pa., has been transferred to the Philadelphia division, with headquarters at Harrisburg, Pa. **A. R. Matteson,** assistant supervisor on the Philadelphia Terminal division, has also been transferred to the Philadelphia division, with headquarters at Harrisburg. **A. M. Kennedy,** supervisor of track on the Maryland division, with headquarters at Perryville, Md., has been appointed assistant supervisor of track on the Baltimore division, with headquarters at Washington, D. C. **H. D. Stowe,** assistant division engineer of the Philadelphia Terminal division, has been appointed supervisor of track to the Delmarva division, with headquarters at Clayton, Del., succeeding **W. G. Pfohl,** who has been appointed assistant supervisor on the Middle division, at Newport, Pa.

John A. Maughan, who has been promoted to supervisor of track on the Lehigh Valley, with headquarters at Easton, Pa., as reported in the May issue, was born on August 20, 1898 at Port Griffith, Pa. Mr. Maughan entered railway service on May 1, 1915, as a timekeeper on the Lehigh Valley at Coxton, Pa., holding this position until August 15, 1917, when he became clerk to the supervisor at Coxton. From September to December, 1918, he was with the U. S. Army, returning to the Lehigh Valley at the end of this period as assistant extra gang foreman at Coxton. On May 1, 1921, Mr. Maughan was advanced to extra gang foreman, which position he held until his recent promotion to supervisor of track, with headquarters at Easton.

Stephan J. Owens, Jr., whose promotion to roadmaster on the Chicago, Burlington & Quincy was reported in the May issue, was born on November 9, 1908, at Chicago, and graduated from the Michigan School of Mines in June, 1931. He first entered railway service as a rodman on the Burlington at Aurora, Ill., on August 25, 1934, and served in that capacity until October 11, 1934, when he was furloughed. He returned to the engineering department of the Burlington as a rodman on July 8, 1935, but left on December 13, 1935, to become a transitman for the Tri-County Irrigation and Power District at Minden, Neb. On March 4, 1936, he returned again to the Burlington, this time as an instrumentman, with headquarters at Lincoln, Neb., and was promoted to assistant roadmaster, with headquarters at Denver, Colo., on July 1, 1937. On December 1, 1937, Mr. Owens was transferred to Lincoln, where he remained until his recent promotion to roadmaster at Orleans, Neb.

J. W. Neikirk, whose promotion to roadmaster on the Norfolk & Western, with headquarters at Roanoke, Va., was reported in the April issue, was born on February 18, 1903, at Chilhowie, Va. Mr. Neikirk attended the public schools at Chilhowie, and later studied with the International Correspondence Schools. On October 1, 1918, he entered the service of the Norfolk & Western as a section laborer on the Radford division, and on October 20, 1920, he was promoted to assistant extra gang foreman. In September, 1923, Mr. Neikirk was further advanced to section foreman, which position he held until February, 1930, when he was promoted to extra gang foreman. In November, 1936, he was made assistant roadmaster, with headquarters at Pulaski, Va., remaining in this capacity until March 1 1937 when he was promoted to roadmaster, with headquarters at Roanoke.

On the Louisville & Nashville

Bridge and Building

J. J. Caldwell, master carpenter of the Wilkes-Barre division of the Pennsylvania, with headquarters at Sunbury, Pa., has been appointed assistant master carpenter of the Williamsport division, with headquarters at Williamsport, Pa.

Earl E. Tanner, supervisor of bridges and buildings of the Mohawk division of the New York Central with headquarters at Albany, N. Y., has been promoted to general supervisor of bridges and buildings of the Lines Buffalo and East, with headquarters at New York, succeeding **Thomas P. Soule,** whose death on March 12 was reported in the April issue. **A. C. Tanner,** assistant supervisor of bridges and buildings at Watertown, N. Y., has been promoted to supervisor of bridges and buildings of the River division, with headquarters at Weehawken, N. J., succeeding **W. B. Burke,** who has been transferred to Albany, to replace Earl E. Tanner. **C. L. Lowell,** inspector of bridges and buildings, with headquarters at Malone, N. Y., has been appointed assistant supervisor of bridges and buildings at Watertown, to relieve A. C. Tanner.

Earl E. Tanner was born in 1885 and is a native of Oswego county, N. Y. After a public school education, he entered railway service with the New York Central on April 1, 1905, as a carpenter on the St. Lawrence division. On September 21, 1910, Mr. Tanner was promoted to bridge and building foreman at Oswego, being further promoted to assistant supervisor of bridges and buildings, with headquarters at Jersey Shore, Pa., on June 1, 1917. On May 1, 1926, he became supervisor of bridges and buildings and served in this position successively at Watertown, Malone and Albany.

Obituary

J. A. McLeod, road supervisor on the Chicago Terminal on the Illinois Central, died in Chicago on May 9.

Harry C. Goodrich, chief engineer of the Bingham & Garfield with headquarters at Salt Lake City, Utah, died at that point on April 20.

Shielded-arc Electrodes—Page Steel & Wire Division of the American Chain & Cable Company, Monessen, Pa., has issued a 12-page booklet describing Page Hi-Tensile G electrodes. Following a brief discussion of the advantages of shielding the hot weld metal from the effects of the oxygen and nitrogen in the air, and of the features of the G electrodes which provide a shielded-arc, the booklet gives detailed operating instructions for fillet, lap, corner, and edge welds, accompanied by diagrams showing the proper position of the electrode, and by tables giving recommended current strength, wire size and speed of welding for various work thicknesses. The booklet concludes with a discussion of stress relieving.

Association News

Roadmasters Association

President W. O. Frame has called a meeting of the Executive committee and chairmen of standing committees at Chicago on June 13 to consider the reports of committees and transact such other business as may now be before the association. A canvass of the chairmen of the committees shows that the reports are well in hand and will be available in tentative form for consideration at that meeting.

Bridge and Building Association

President C. M. Burpee is planning to call a meeting of the Executive Committee at Chicago early in July to review the reports of committees. A. S. Krefting, assistant engineer on the Soo Line, Minneapolis, Minn., has accepted the chairmanship of the Committee on Recent Developments in Field Methods in the Construction of Timber Trestles, succeeding C. L. Metzmaker.

Track Supply Association

At a meeting of the Executive Committee at Chicago on May 17, President Jass Mossgrove and Secretary Lewis Thomas were instructed to proceed with plans for the exhibit to be held concurrently with the convention of the Roadmasters and Maintenance of Way Association at the Hotel Stevens, Chicago, on September 20-22, and to mail reservation blanks for exhibit space to prospective members. Although these blanks did not get into the mail until May 24, several application have been received at the time this issue went to press.

American Railway Engineering Association

In accordance with recent changes made in the constitution affecting the positions of secretary and treasurer, making these positions appointive by the Board of Direction rather than elective by the membership, the board has announced the appointment of W. H. Penfield, chief engineer, Chicago, Milwaukee, St. Paul & Pacific, as treasurer, effective June 1, succeeding A. F. Blaess, until recently chief engineer of the Illinois Central, resigned. It has also been announced that the proposed changes in Articles II and III of the constitution with regard to membership, admissions and expulsions, which were submitted to letter ballot early in May, have been adopted by a vote of 505 to 16. These changes were voted effective June 1, and went into effect as of that date.

The proceedings of the association for 1938, Volume 39, have been practically completed, and it is expected that they will be ready for mailing during the latter part of June. All 1937 Manual revisions have been made and are in the hands of the printer, and it is expected that they will be ready for mailing the latter part of July.

The June bulletin, which is the first to be issued since the convention in March, will be ready for mailing the last of June, and, among other things, will contain the addresses presented at the March convention by Dr. H. F. Moore, on progress in the joint investigation of fissures in railroad rails, and by Dr. A. N. Talbot, on stresses in track. The bulletin will also include the preliminary report of the Committee on Ties with regard to the 1937 tie renewal statistics.

Five committees held meetings in May, these being Iron and Steel Structures, at Harrisburg, Pa., on May 5 and 6; Economics of Railway Labor, at St. Louis, Mo., on May 24; Buildings, at Chicago, on May 24 and 25; and Rail, at New York, on May 25.

Three committees have scheduled meetings for June, as follows: Roadway and Ballast, at Chicago, on June 14; Water Service, Fire Protection and Sanitation, at St. Louis, Mo., on June 20; and Wood Bridges and Trestles, at Chicago, on June 22.

The booklet on Outline of Work and Personnel of Committees that has been mailed to all committee members, shows that a total of 40 new subjects have been assigned to 14 of the association's 27 standing and special committees. The list below gives the new subjects assigned following the name of each committee affected.

Roadway and Ballast—Specifications for vitrified clay pipe culverts; settlement, shrinkage and subsidence of roadway; ventilation in tunnels; close clearance sign; and investigate the use of asphalt in ballast.

Ties—Investigate and report on the dimensions of ties, and bring up to date the information presented in the 1924 and 1932 proceedings.

Rail—Investigate the advisability of straightening bent and kinked rails for reuse in main lines.

Buildings—The requirements and design of garage buildings for railway service; drinking water facilities in railway buildings; railroad test laboratories—layout and test equipment; and drop pits—jacks and tables.

Wood Bridges and Trestles—The use of tar and asphalt compositions for wearing surfaces on wood-floored highway bridges.

Masonry—The suitability of steel beam bearing piles; and the progress which has been made in cement manufacture and test.

Highways—Develop drawings showing general requirements for the installation of automatic gates; and prepare requisites for the floodlighting of railroad-highway grade crossings.

Water Service, Fire Protection and Sanitation—Types and uses of hose pipes or nozzles; trucks for use by water service maintenance forces; conditioning water for vapor boilers on streamliners and Diesel units; and methods for checking and handling the control of locomotive blowdowns.

Yards and Terminals—The arrangement of tracks and facilities for passenger stations and engine terminals required to meet the demands of internal combustion and electric locomotives; the substitution of outlying yards and facilities for yards and other large facilities in cities where land values are high; and the adaptation of enginehouses, shops and engine terminal layouts for the handling of oil-electric locomotives and rail-cars.

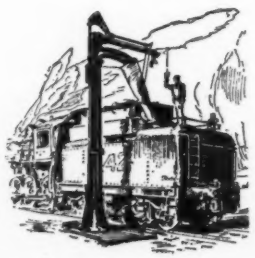
Economics of Railway Location and Operation—The effect of inland waterway transportation on the economics of railway operation; the effect of high speed on railway operating expenses; and the effect of rail oiling on train operation.

Wood Preservation—Developments in methods of wood preservation; and present practice in the use of preservatives.

Uniform General Contract Forms—Form of agreement to cover the operation of commissary and boarding outfits; and form of lease for air-right development.

Economics of Railway Labor—The effect of increased weight of rail on track labor; sanitary provisions in camps and cars for housing labor; the relative economy of combined vs. separate bridge and building gangs; the effect of modern equipment and machines on bridge gang organizations and efficiency; the economic relation between supervision and labor; and the effect of sudden fluctuations in maintenance expenditure allowances on maintenance costs.

Maintenance of Way Work Equipment—Concrete vibrators; railway owned automotive equipment; power tools for bridge maintenance; and safety devices for work equipment.



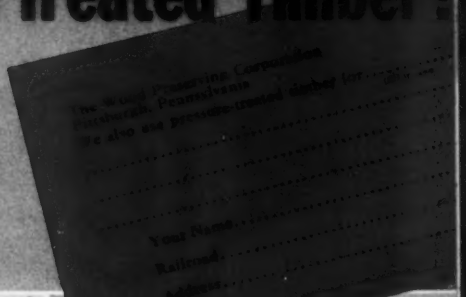
Simplex Jacks—Templeton, Kenly & Company, Chicago, has issued a four-page illustrated folder in which are described the various types of track and bridge jacks manufactured by this company. This company's rail puller, rail joint expander, tie spacer and other items of track equipment are also featured in the folder.

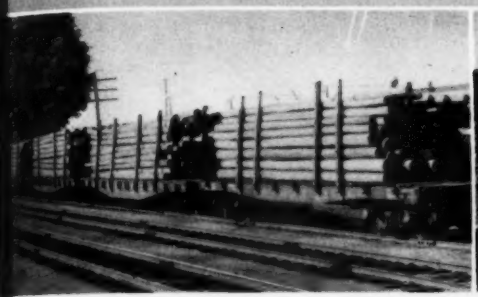
American Gopher—Catalog GS-3, issued by the American Hoist & Derrick Company, St. Paul, Minn., deals exclusively with the American Gopher, Model 350 ½-yd. shovel, which, operated by gasoline or Diesel engine, or by electric power, can be readily adapted for use as a crane or a dragline. The booklet, which is well illustrated, discusses in detail the construction of the crawler mounting, the roller path and bull gear, the machinery deck, the reversing friction and drum shaft assemblies, the chain crowd, and the boom assembly of the convertible shovel, and includes specifications covering dimensions, clearances, weights, speeds in addition to other pertinent operating data.

BESIDES TRACKS

In how many places do you use Treated Timber?

Railroads, pioneers in the use of pressure-treated timber, are constantly finding new uses for this product which saves them thousands of dollars every year by cutting down replacement and maintenance costs. Tell us about the new uses which have been created for pressure-treated timber on your railroad.





1 PILING arriving at the Nashua, N. H. plant for air seasoning and pressure treatment with creosote. This type of piling, widely used for railroad trestles, is stocked at treating plants of The Wood Preserving Corporation, located at strategic points throughout the country.

2 BRIDGE TIMBERS: Bridge timbers, framed before pressure treatment with creosote. This assures thorough penetration of the creosote into all fabricated parts. There are facilities for framing structural members before pressure treatment at all the treating plants of The Wood Preserving Corporation.

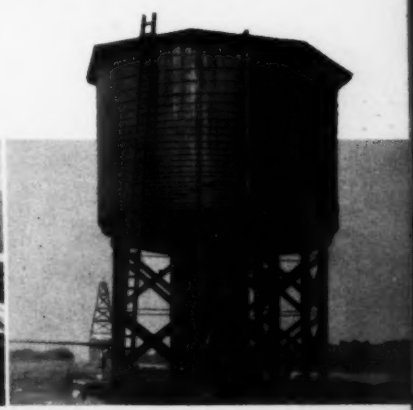
4 TRESTLE RIGHT-OF-WAY: Pressure-treated timbers and pressure-treated cross ties produce a time-resisting trestle that is low in first cost and economical in annual maintenance expense.

3 TRESTLES: A completed trestle showing how pressure-treated piling and pressure-treated bridge timbers have been used to add years to the life of the structure.

OTHER PRODUCTS AND USES FOR PRESSURE-TREATED TIMBER

7 Platforms
8 Culverts
9 Cribbing
10 Crossing Planks
11 Poles and Posts
12 Car Stock
13 Structural Timber
14 Fences
15 Piers
16 Wharves
17 Cooling Towers
18 Third rail Ties and Guards
19 Flume
20 Trench Lining and Covers

Ask us for information on additional Koppers products and services



5 TIES: The advantages of creosote pressure-treated cross ties have long been recognized. The Wood Preserving Corporation has ample stocks of material which permit immediate shipments. This photograph shows ties in storage for air seasoning before pressure treatment with creosote.

6 WATER TANKS and their supporting structures have much greater life when built of pressure-treated timber. Many railroads find that this type of tank gives greater service per dollar of cost than any other kind.

THE WOOD PRESERVING CORPORATION

PITTSBURGH, PA.

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NATIONAL LUMBER & CREOSOTING COMPANY

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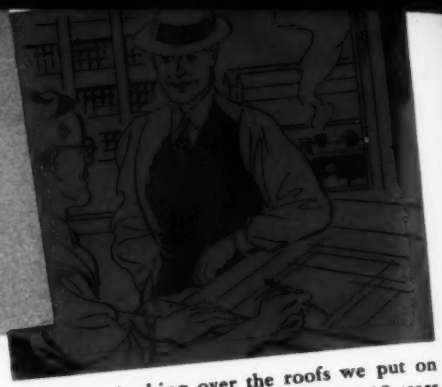
THE ROOFING THAT *Stays young* WITH THE RAILROAD



I've been looking over the roofs we put on some of those freight house buildings 10 years ago. They look just about as good as the day we put them on. Seem actually to have improved with age.

Yes, I guess we didn't make any mistake on those roofs. And you're right . . . they still have a lot of life in them. Because, actually, they're good for at least ten more years of trouble-free service.

They haven't given me a bit of maintenance trouble, either. That self-healing feature takes a big load off my mind. Small cracks that would cause leaks in most roofs heal themselves without any attention.

Seems as though we agree on Koppers Ro The P. A. had a little bit of a selling job t at first, but he has everyone convinced no guess we've solved the roof problem.

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Bituminous-base Paints . . . Coal . . . Coal Handling Plants . . . Coal Washing Systems . . . Coke . . . Creosote . . . Deodorants . . . D-H-S Bronze Castings, and Iron Castings . . . Disinfectants . . . Fast's Self-aligning Couplings . . . Fire Hydrants . . . Insecticides . . . Locomotive Cylinder Packing . . . American Hammered Piston Rings . . . Pipe . . . Pressure-treated Ties, Poles, Posts and other Treated Timber . . . Roofing . . . Tanks . . . Tarmac for Paving . . . Waterproofing . . . Weed Killers

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Supply Trade News

Personal

E. T. Cross, eastern manager of the **Ingot Iron Railway Products Company,** Middletown, Ohio, with headquarters at Philadelphia, Pa., has been promoted to general manager, with headquarters at Middletown.

William Arthur has been appointed manager of the Philadelphia, Pa., district, for the **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., to succeed the late J. E. Wray. Mr. Arthur was the company's special representative for railway traction and mercury arc rectifiers in the East, attached to its New York and Philadelphia offices.

J. B. Tytus has been elected vice-president in charge of operation of the **American Rolling Mill Company,** Middletown, Ohio, and **Frank H. Fanning** has been appointed assistant vice-president in charge of operations. Mr. Tytus joined the Armco organization in 1904 and he was elected vice-president in charge of processing developments in 1927. Mr. Fanning entered the organization in 1909 and was associated with Mr. Tytus in 1912 at the Armco mill at Middletown; he later served on numerous special assignments and was appointed assistant to the executive vice-president in 1933.

Joseph B. Strauss, president of the Strauss Engineering Corp., Chicago, and honorary chief engineer of the San Francisco Golden Gate bridge, died in Los Angeles, Cal., on May 16, following a heart attack. During his career he designed more than 400 bridges in this country and abroad, the most outstanding being the Golden Gate bridge at San Francisco, of which he was chief engineer. He was born in Cincinnati, Ohio, in 1870, and was graduated from the University of Cincinnati in 1892. Upon graduation he became an instructor in the College of Engineering at the University of Cincinnati and in 1902 he became a consulting engineer in private practice. Two years later he became president and chief engineer of the Strauss Bascule Bridge Company, which became the Strauss Engineering Corp. in 1927. He had made a specialty of movable and long-span bridge designs, and originated the Strauss trunnion bascule bridge and also the Strauss lift bridge.

C. L. Schoonover, president of the Warren Tool Corporation, Warren, Ohio, died on May 22 following a heart attack. Mr. Schoonover was born in Akron, Ohio, on August 11, 1869. In 1892 he was appointed bookkeeper of the Neracher Sprinkler Company, Warren, Ohio, and following the reorganization of this company into the General Fire Extinguisher Company, he held the positions of department cashier, superintendent of engineering and construction, assistant plant manager and plant manager in charge of the pipe fabricating shop and fittings foundry. He resigned from the latter position in August, 1925, and in August, 1931, was employed by the Midland Bank of Cleveland, Ohio, as trustee of the Warren Tool & Forge Co. He operated this company for 14 months as agent for the trustee and the receiver, and upon the reorganization of the company into the Warren Tool Corporation in October, 1932, he was elected president and general manager, which position he held at the time of his death.

Trade Publications

The Linde Air Products Company, a unit of the Union Carbide and Carbon Corporation, has moved its Boston district office to 441 Stuart street, Boston, Mass.

Duplex Steam Pumps—Fairbanks, Morse & Company, Chicago, is distributing an eight-page folder describing its line of duplex steam pumps. A table of sizes and ratings is included.

Rockflux—The Flexrock Company, Philadelphia, Pa., is distributing a four-page pamphlet devoted to Rockflux, an acid-resisting floor resurfacer.

Chemical Mixing Tank—The Graver Tank & Manufacturing Company, Inc., New York, is distributing a four-page illustrated folder in which is described this company's new chemical mixing tank for softening water, a unit that is especially adapted to railroad use.

Caterpillar Diesel Engine—A 32-page, attractively-printed and illustrated catalog bearing this title has been published by the Caterpillar Tractor Company, Peoria, Ill., in which is given essential information, including performance curves, of the various Diesel engines manufactured by this company. General information concerning Caterpillar Diesel engines is also given, including dimension charts and a table of specifications.

Wrought Iron Tanks—The A. M. Byers Company, Pittsburgh, Pa., has issued a bulletin of 32 pages illustrating and describing a large number of wrought iron tanks that have rendered satisfactory service for many years, the oldest being a railroad roadside tank built in 1881. Pages devoted to descriptions and illustrations of these tanks are followed by others in which recent installations of wrought iron tanks (including one of railroad track pans) are illustrated and described.

Thermit Welding—The case for continuous rail is set forth in the booklet: "Continuous Rail for Main Line Track," issued by the Metal & Thermit Corporation, New York. This booklet, containing 40 pages, first discusses the advantages and savings claimed as possible through the elimination of rail joints by welding. Then, after tracing the history of thermit rail welding from its introduction early in this century, through its use in paved track and later in tunnels and in open track, the booklet relates the extent to which thermit welded rails have been used in Germany, France, England, and Australia, and then discusses the various installations which have been made in the United States. The booklet is profusely illustrated, and includes a thorough description of the Thermit process as applied to rail welding, and of the equipment employed in it.

Welding Electrodes.—The Stulz-Sickles Company, Newark, N. J., has published a 16-page illustrated pamphlet which discusses the various applications of this company's line of welding electrodes, applicator (filler) bars, forged wedges and wedge bars.

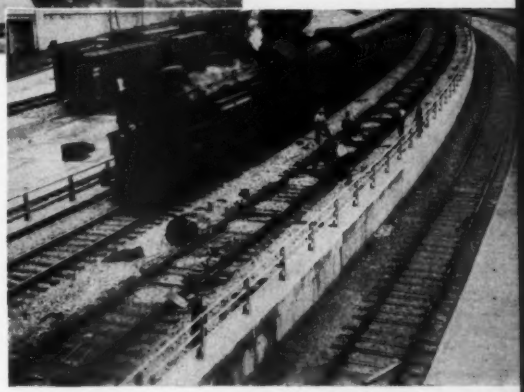
Core Drills—The Ingersoll-Rand Company, New York, has issued a 44-page catalog explaining the operation of Calyx core drills in soft earth and in rock formations. The catalog pictures these drills in use in all parts of the world, and concludes with detailed descriptions of derricks, engines, pumps, drill heads, water swivels, cutters and bits, and other accessories used with these drills.

Faster Power—This is the title of a 40-page illustrated booklet recently published by the Allis-Chalmers Manufacturing Company, Milwaukee, Wis., which contains brief descriptions of the various sizes and types of crawler tractors manufactured by this company. Space is also devoted to brief descriptions of blade graders, snow plows and material-hauling units. Specifications concerning the various units are also included.

Built-Up Roofs—Information on the latest types of built-up roofing is included in the revised edition of "Johns-Manville Bonded Built-Up Roofs," which has been issued by Johns-Manville, New York. This book now contains more than forty complete detailed specifications on J-M built-up roofs, accompanied by many drawings which show the manner of applying roofing materials to various types of roof decks. A new table of condensed specification data is included, and the subjects of roof insulation and various methods of base and cap flashing are also discussed at length.

Steel Derricks—The American Hoist & Derrick Company, St. Paul, Minn., has issued Catalog D-1, which describes and illustrates its line of heavy-duty and medium-duty stiffleg derricks, guy derricks, steel erector's guy derricks and marine derricks. The description of each type of derrick is accompanied by a size and rating table, and following this part of the catalog are specifications covering the various parts of the derricks. The catalog also includes reference to the general purpose hoists and derrick accessories manufactured by the company.

ALPHABETICAL INDEX TO ADVERTISERS



The PIONEER RAIL WELDING PROCESS

Wasp-waisted women wore bustles and leg-o-mutton sleeves . . . peg-top trousers were the style for men . . . scenic china picturing Dewey at Manila graced the nation's plate racks, when the first Thermit Welded track was installed.

To Thermit Engineers, the welding of rails is an old story . . . one with which they have become thoroughly familiar through nearly four decades of continuous research and practical application. There are few problems in rail welding, on railroads or street railways, with which they have not had first-hand experience.

With authorities agreeing that nearly fifty per cent of present track maintenance can be saved by eliminating rail joints, you will want full data on the Thermit Weld. You will be interested in learning how small the equipment is; how your own track forces can be quickly trained to do the work. You will want to know, also, why the Thermit process provides the ideal type of rail weld. Write, today, for complete information.

THERMIT Rail WELDING

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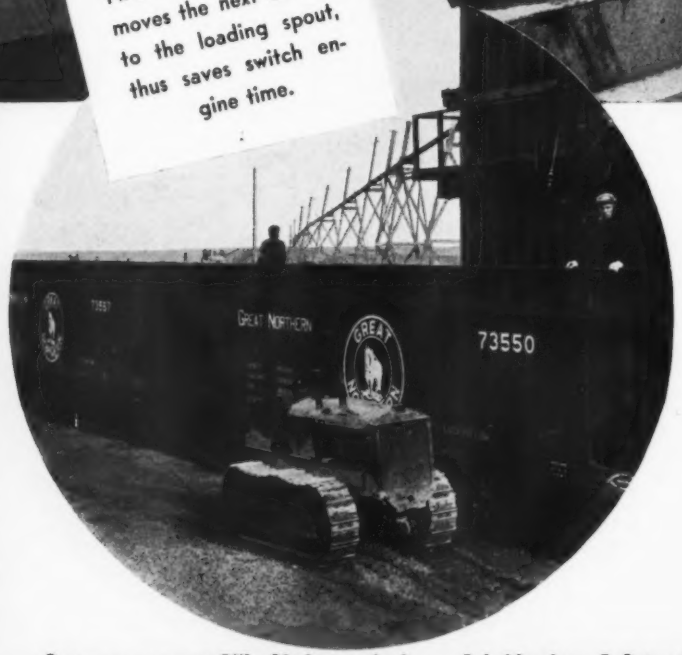
HOW TO LOWER HANDLING COSTS IN RAILWAY YARDS

Model IU tractor fitted with Hughes-Keenan Roustabout Crane, handling bridge and rail timbers in a West Coast yard. It's fast, handy and works off the tracks—no interference with switching activities.

Model K Tractor, between other tasks, moves the next car up to the loading spout, thus saves switch engine time.



Put Allis-Chalmers tractors—wheel or track-type—to work on such jobs as loading and unloading c... shifting timbers and rails, shunting cars on to sid... filling in mudholes and leveling around the yards, ... ing and dismantling track, removing snow in wi... and handling scores of other yard chores. No ... lost getting up steam—A-C tractors start inst... and go right to work. No big crews kept idle w... switching heavy equipment from one task to ano... —A-C tractors cut across the lot, get from one t... to another with ease, leave your switching engi... free for their regular work.

See your nearest Allis-Chalmers dealer. Ask him how A-C tractors, working off the tracks, can cut handling costs in your yard...

Gasoline and Controlled Ignition Oil Track-Type Tractors from 32 to 80 Drawbar H. P. . . . Tandem and Single Drive Speed Patrols . . . Drawn Blade Graders . . . Industrial Wheel Tractors . . . Stationary Power Units from 31 to 102 Brake H.P. . . . two, four and six-wheel scrapers, bulldozers, trailbuilders, loaders, winches and other allied equipment

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